DOCUMENT RESUME

ED 055 846 SE 012 458

TITLE	Outdoor Recreation Research, A Reference Catalog, 1970, Number 4.
INSTITUTION	Department of the Interior, Washington, D.C. Bureau of Outdoor Recreation.; Smithsonian Institution, Washington, D.C. Science Information Exchange.
PUB DATE	Jan 71
NOTE	125p.
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 ($1.25)
EDRS PRICE	MF-$0.65 HC-$6.58
DESCRIPTORS	*Annotated Bibliographies; *Environmental Education; Government Publications; Land Use; Natural Resources; *Outdoor Education; Recreational Facilities; *Research; Wildlife Management

ABSTRACT

This reference catalog lists and describes 427 current or completed outdoor recreation and related environmental quality research projects. Projects are grouped into one of three categories: resources, economics, and user studies. The catalog is designed to assist scientists, administrators, planners and students by facilitating the exchange of information and research results. Indexes provided for the reader's benefit consist of subject, investigator, supporting agency and contracting agency. (BB)

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OUTDOOR RECREATION RESEARCH

Reference Catalog — 1970

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ABSTRACT

Four hundred twenty seven currently active or recently completed outdoor recreation and related environmental quality research projects are listed and described briefly. Projects are grouped into one of three categories; resources, economics, and user studies. Indexes provided for the reader's benefit consist of subject, investigator, supporting agency and contracting agency.

Keyword: Economic analysis, Environmental quality, Natural resources, Research, Research ideas, Research methods, Research process, Research programs, Research projects and Users.

DEPARTMENT OF THE INTERIOR
Rogers C. B. Morton, Secretary
Bureau of Outdoor Recreation
G. Douglas Hofe, Jr., Director

ED055846

OUTDOOR RECREATION RESEARCH

A REFERENCE CATALOG • 1970

Number 4

Published January 1971

DEPARTMENT OF THE INTERIOR
Bureau of Outdoor Recreation
and
Smithsonian Institution
Science Information Exchange

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 - Price $1.25

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FOREWORD

This fourth catalog of Outdoor Recreation Research assembles in one volume brief descriptions of 427 currently active or recently completed outdoor recreation and related environmental research projects. The catalog is published periodically by the Bureau of Outdoor Recreation as part of its responsibility "to promote the coordination and development of effective programs relating to outdoor recreation," as declared in Public Law 88-29.

The catalog series was initiated in 1966, and has been prepared in cooperation with the Science Information Exchange of the Smithsonian Institution. This document is an important part of the Bureau's programs of sponsoring, performing, and assisting research relating to outdoor recreation matters, and compiling information of value to outdoor recreation programs and educational institutions.

Selection of projects was based on the relationship of the research to the field of outdoor recreation and environmental quality aspects of recreation resources.

Where interim or preliminary reports or other helpful prepared releases were reported by the principal investigators, the information is included with the research summary. The compilation is designed to assist scientists, administrators, planners and students by facilitating the exchange of information and research results.

Despite conscientious and extended efforts to encourage institutions, organizations and individual researchers to submit materials for inclusion in this catalog, certain eligible projects may not have been listed. It is possible that a few projects are repeated due to multiple support, revision of summaries by researchers, change of principal investigator and the like. We hope these deficiencies are minor compared with the large number of important and promising projects that are reported.

The assistance of all who contributed to this report is appreciated. It is hoped that its publication will improve the effectiveness of the combined effort of investigators who are helping to find solutions to many recreation and related environmental quality problems.

G Douglas Hofe Jr.

G. Douglas Hofe, Jr.
Director

Editor's Note

The fourth volume of the Outdoor Recreation Research Catalog has been prepared by the Science Information Exchange of the Smithsonian Institution under support from the Bureau of Outdoor Recreation. Selection of projects for inclusion was made by the Bureau of Outdoor Recreation. The projects selected reflect the program areas in outdoor recreation and environmental quality that are of prime concern to the Bureau.

Along with the summaries of the projects, the catalog contains the following indexes: Subject Index, Investigator Index, Contracting Agency Index, and Supporting Agency Index. The information which appears in the summaries and the indexes was taken directly from the project record as received by the Science Information Exchange. Immediately following the summary there appears the Science Information Exchange identification number for additional reference.

The Subject Index is a hierarchical arrangement of index items, indicating relationships between broader and narrower concepts. The index term is followed by the project title, and the chapter identification number of the project. As a further aid in locating subject areas, the first high-level hierarchical term to appear on a left-hand page will be shown in the upper left-hand corner of that page, and the last high-level term to appear on the right-hand will appear in the upper right-hand corner of that page, in dictionary fashion. It is suggested that the reader first check the Index Outline which immediately precedes the Subject Index.

The Investigator Index is an alphabetical listing of the investigators listed on the project record. An asterisk designates the principal investigator. Unless specified, the first name listed on the project record was selected as the principal investigator. In several instances it is apparent that the "investigator" denoted on the source document is, in fact, a program manager, who may not be at the institution or location listed with the project record or displayed with the other indexes.

The Supporting Agency Index (indicating funding sources) and the Contracting Agency Index (indicating performing organizations) are single alphabetical listings.

All of the Indexes in this catalog were generated by means of a computer, necessitating a limitation on the number of characters available for index terms and captions. Thus, in some instances, abbreviations had to be used.

In order to insure publication of this current research catalog by early 1971, it was necessary to declare August 15, 1970, as the latest date for inclusion of Notices of Research Projects in this volume. In instances in which investigators were unable to meet this date or research was registered with the Exchange after August 15, 1970, the projects were not included in this volume, but hopefully will appear in a subsequent publication of this scope.

This catalog is published and distributed by the Bureau of Outdoor Recreation. Single copies may be obtained on request from the Bureau as long as supplies last.

It is our desire that the users of this catalog further acquaint themselves with the services of the Smithsonian's Science Information Exchange. As a National Registry of Research in Progress, the Exchange receives 100,000 summaries of on-going research each year defining Who is planning What research, Where and How supported. We invite your questions and registration of your current research efforts. For additional information, write Science Information Exchange, Smithsonian Institution, 1730 M Street, N. W., Washington, D. C., 20036.

Readers are requested to advise the Science Information Exchange of any errors of omission or commission that have been made. Also, critiques of this volume are encouraged so that future editions may present research information in a manner most convenient and acceptable to the user.

Monroe E Freeman

Monroe E. Freeman, Director
Science Information Exchange

SI-SIE-78A; REV. 6-64

NOT FOR PUBLICATION OR
PUBLICATION REFERENCE

NOTICE OF RESEARCH PROJECT
SCIENCE INFORMATION EXCHANGE
SMITHSONIAN INSTITUTION

SIE NO.
AGENCY NO.

SUPPORTING AGENCY:

TITLE OF PROJECT:

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project.

NAME AND ADDRESS OF INSTITUTION:

SUMMARY OF PROPOSED WORK – (200 words or less.) – In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes.

SIGNATURE OF
PRINCIPAL INVESTIGATOR ____________________

PROFESSIONAL SCHOOL
(medical, graduate, etc.) ____________________

GUIDELINES FOR COMPLETING FORM ARE GIVEN IN THE DOTTED BLOCKS

SI-SIE-78A; REV. 6-64

NOTICE OF RESEARCH PROJECT
SCIENCE INFORMATION EXCHANGE
SMITHSONIAN INSTITUTION

SIE NO.

AGENCY NO.

SUPPORTING AGENCY:

TITLE OF PROJECT:

Title should be as specific as possible

Give names, departments, and official titles of PRINCIPAL INVESTIGATORS and ALL OTHER PROFESSIONAL PERSONNEL engaged on the project.

1. List the Project Director first if more than one name appears.
2. Person listed is associated with university, include his school, and if a department affiliation. For other types of organizations, include corresponding divisional and unit designations, if any.

NAME AND ADDRESS OF INSTITUTION:

Name and address of institution responsible for performing the research.

SUMMARY OF PROPOSED WORK – (200 words or less.) – In the Science Information Exchange summaries of work in progress are exchanged with government and private agencies supporting research, and are forwarded to investigators who request such information. Your summary is to be used for these purposes.

The summary is used as a means of communication and is preferably written by the Project Director who is familiar and closely associated with the project. This summary should not contain information that cannot be given other research scientists and program personnel. It provides information on the work not yet published and not otherwise available. The summary should describe the problem clearly, show relationships to other aspects or to broader areas of research & program development and should identify plan of procedure, techniques, instruments and special materials, special environments, etc. Each record should summarize a single project or a small discrete unit so that it may be analyzed and indexed in technical depth and detail for effective use.

If work is being performed elsewhere than at location of recipient's institution, indicate where.

The last sentence of the project description should state the month and year in which the project is to be started and the month and year in which it is anticipated that it will be completed.

Currency of Reporting -
This form should be:
(1) Submitted at the start of each new project
(2) Reviewed and revised annually thereafter, or
(3) Whenever a project is substantially changed.

Please do not register a project supported by a Federal agency, foundation, or fund raising agency, if you have already registered such a program at SIE during the current fiscal year.

SIGNATURE OF PRINCIPAL INVESTIGATOR ____________

PROFESSIONAL SCHOOL (medical, graduate, etc.) ____________

Person signing for the Performing Agency

(A) Dates of current project authorization (Month/year to Month/year)
(B) Annual level of effort in dollars, if specified
(C) If multiply funded, the annual dollar support by each sponsor

NOTE: FUNDING INFORMATION IS NOT RELEASED EXCEPT WITH APPROVAL OF SUPPORTING AGENCY, OR TO AUTHORIZED REVIEWING BODIES.

DESCRIPTION OF RESEARCH TASKS

1. RESOURCES

Land, Water, Human and Animal Assets to Outdoor Recreation and The Related Environments

1.0001, VIROLOGICAL METHODS RESEARCH IN WATERS

W.F. HILL, U.S. Dept. of Hlth. Ed. & Wel., P.H.S. Environ. Health Service, *Dauphin Island, Alabama* 36528

This project is concerned with developing and evaluating the systems requirements for isolating virus from large quantities of virus- contaminated water. This includes, but is not limited to, waters used for drinking, recreation, reclamation, and food production. The major problem reduces to the inadequacy of available methodology to sample, isolate, and concentrate viruses occurring at low multiplicity levels in oaters. Methods providing for at least a 1,000-fold concentration of virus are needed at the outset to satisfy a reasonable sensitivity level. At the outset, a sequential methods approach will be implemented. This approach will encompass the adaptation of membrane filtration to sampling and recovery of viruses from large volumes of environmental waters. Concentration of low multiplicities of recovered virus from eluates will involve evaluation of a number of procedures such as hydroextraction, polyelectrolyte and/or aluminum salt flocculation, and ultracentrifugation. Initially, the sequential methods technic will be applied to estuarine waters under laboratory conditions using a 'model' (poliovirus 1) enteric virus. This project was started in July 1969 and is continuing.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - P.H.S.

1.0002, MASTER PLAN FOR THE PROPOSED KEYSTONE CANYON STATE PARK

J.E. HOFFMAN, Univ. of Alaska, Inst. of Soc. Ec. & Govt. Res., *College, Alaska* 99701

The purpose of the master plan is to identify significant natural and historical park and recreation resources, to relate these resources to appropriate park and recreation developments, and to recommend a course of action. In addition, the master plan identifies all major factors which will have an effect on the management of the area as a state park.

The proposed Keystone Canyon State Park lies in the Chugach Mountains near Valdez in the south central region of Alaska. High segments of the mountains on the north and south are dominated by extremely rugged ridges 5,000 to 7,600 feet in elevation. The higher parts of the north and south boundaries contain ice fields from which valley glaciers radiate.

In 1899 the U.S. Army constructed an all-American, all-weather trail from Valdez, through the proposed state park, and on into the interior of Alaska. The Richardson Highway, the successor to the Army Trail, bisects the proposed park in a northeast-southwest direction.

The 800 mile, 48 inch oil pipeline from the North Slope to Valdez is planned to pass through the proposed Keystone Canyon State Park.

SUPPORTED BY Alaska State Government

1.0003, INVESTIGATION OF PUBLIC FISHING ACCESS REQUIREMENTS

J.L. BERGSTRAND, State Dept. of Fish & Game, *Juneau, Alaska* 99801

Physically examine recreational fishing areas and make an evaluation of each potential area for public access requirements. Determinations obtained by: a) studying the nature of the existing fishery or biological potential present b) anticipating future angler use as determined by current use, public works projects and accessibility.

Make recommendations to various state, federal and local land managing public agencies for the withdrawal or classification of lands for access sites or rights-of-ways. Conduct inter-agency field investigations and take an active role in land planning activities.

Create and maintain a statewide water catalog which will include information on Township, Range and Section, Management region, watershed, U. S. G. S. map location, access site acreage, land agency case number, water quality, type of drainage, surface acres and fisheries. This material prepared in such a manner that it could be stored on magnetic tape for retrieval by data processing techniques.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0004, SALT WATER SPORT FISH HARVEST STUDIES IN SOUTHEAST ALASKA

M. MCHUGH, State Dept. of Fish & Game, *Juneau, Alaska* 99801

Objectives: (1) To compile an annual estimate of the number and species, by area, of the recreational harvest of salt water fishes. (2) To compile indexes to size and age group with emphasis on salmonids.

Procedures: (1) Sport fish harvest data will be obtained from a continuation of established creel census studies currently being conducted. a. Boat landings and areas of intensive angling will be censused in a manner that will produce the maximum number of the angler interviews. Boat counts will be made by skiff and aerial surveys. Interviews will be made at selected landing areas. b. The area location of each catch will be determined insofar as possible and recorded with other pertinent information on fishing techniques and gear used as part of each interview. (2) Lengths, weights, scale samples and other biological information will be collected as required. (3) Compilation of fish harvest data will be by population and geographical districts as follows: Juneau, Sitka, Petersburg and Ketchikan areas.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0005, EVALUATION OF RESEARCH ON ROADSIDE DEVELOPMENT

W.O. EARLEY, Western States Landscape Asso., *Phoenix, Arizona* 85013

Past and present research on roadside development is being reviewed, interpreted, and evaluated, areas described where additional or continued research is needed, and procedures recommended for resolving these needs. The study will include, but not be limited to, consideration of the relationship of roadside development and (1) highway location and design, (2) vegetation (planning, establishment, and management by plant growth zones in consideration of erosion control and roadside plantings), (3) resource conservation, (4) rest areas, scenic turnouts, and overlooks, (5) safety, and (6) right-of-way, scenic areas, and adjacent land use. Recognition will be given to research under way or accomplished in legal authority, but it will not be evaluated in this project. During the initial period of research, major emphasis has been on project organization and the listing of available information of roadside development research. A questionnaire is being prepared for circularization of state highway departments, research agencies, and educational institutions to obtain additional information on research and experience in this area.

SUPPORTED BY U.S. Dept. of Transportation - Public Rds.

1.0006, REMOVAL OF PHOSPHATE AND SECONDARY B.O.D. FROM TERTIARY TREATED WASTEWATER BY AQUATIC ANIMALS

C.D. ZIEBELL, Univ. of Arizona, Arizona Coop. Fishery Unit, *Tucson, Arizona* 85721

The purpose of the proposed research is to test the practicality and methodology of phosphate removal from reclaimed wastewater by aquatic animals with subsequent harvest of these animals for a useful purpose.

Phosphate removal by present sewage treatment methods rarely is sufficient to prevent stimulation of undesirable algae growths. Rank algae growths are a secondary source for biochemical oxygen demand, they reduce the value of boating and fishing lakes and increase the difficulty of pumping reclaimed wastewater into permeable underground strata.

Project investigations will include: 1. Replicated experiments to measure rate of removal of algae and organic ooze (and incorporated phosphate) by selected fish and mollusks. 2. Experimental units at least 1000 gallons or larger depending on applicability. 3. Chemical analysis of water, bottom ooze and fish to evaluate degree of phosphate removal.

Data will be evaluated for practical application in sewage lagoons and reclaimed wastewater ponds with respect to recreation and domestic usage.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0007, CONCEPT STATEMENT FOR THE NATIONAL LEISURE INSTITUTE

C.D. DOWELL, Arkansas Polytechnic College, Undergraduate School, *Russellville, Arkansas* 72802

The concept statement proposes that a major effort be made to define the challenges of man's leisure. This effort is to be launched through the establishment of a National Leisure Institute which is to be a joint venture of the Ozarks Regional Commission, Arkansas Polytechnic College and the National Recreation and Park Association. The institute will provide a multidisciplinary focus on leisure as an integral and vital force in society.

Four major goals which comprise the basic purpose of the Institute are: (1) To conduct research in leisure services and consumptive behavior. (2) To serve as a demonstration and testing center for experimenting with various concepts and innovations to serve the leisure field. (3) To provide consultative services and technical assistance to committees, public agencies, landowners and private industry. (4) To provide continuing education programs for public and private leaders dealing with leisure services.

The headquarters for the Institute is a composite of 2200 acres on Dardanelle Reservoir near Russellville, Arkansas. The Institute will be a non-profit corporation with an 11-member Board of Directors selected from industry, the nation, the region and the community. Because of its location, supportive and innovative programs will evolve from a close working relationship with Arkansas Polytechnic College and existing leisure service industries in the area.

SUPPORTED BY U.S. Ozarks Regional Comm. - Washington

1.0008, THE RELATIONSHIP OF RESERVOIR PLEASURE BOATING TO SELECTED METEOROLOGICAL FACTORS

C.D. DOWELL, Arkansas Polytechnic College, Undergraduate School, *Russellville, Arkansas* 72802

The intensity of climatological affectors is responsible for participation overloads on outdoor recreation facilities during certain seasons of the year. The purpose of this study was to determine the relationship between pleasure boating and local weather. For a 12 month duration, pleasure boat launchings were recorded by traffic pressure- hoses at Dardanelle Reservoir, Arkansas. By linear regression analysis, a relationship between boat launchings and locally recorded weather elements was determined.

Conclusions of the study were: (1) boat launchings reflected definite seasonality, irrespective of local weather conditions, summer was the highest boat launching season, May the highest launching month and July 4th the highest launching day; (2) on an annual basis, mean air temperature had a highly significant positive coefficient and precipitation had a significant negative coefficient; (3) approximately 90% of the launchings occurred on days with a daily mean temperature range between 56 degrees - 86 degrees F., 81% occurred on days with 45 miles or less of total wind, 90% occurred on days with less than 0.50 inches of precipitation and 81% occurred on days with barometric pressure change between - 0.10 and 0.10 inches; and (4) on a seasonal basis, definite variations in the influences of the selected meteorological factors were apparent.

Daily mean air temperature and precipitation may serve as valuable indicators for estimated boat launchings, especially in the Spring and Fall. Reservoir boating management might assume these two factors dictate the levels of boating participation until more data are available. Some 65% of the variation in launchings were accounted for by the four selected meteorological factors.

SUPPORTED BY U.S. Dept. of Defense - Army

1.0009, A 1970 PHOTOGRAPHIC RECONNAISSANCE OF THE ARKANSAS RIVER SHORELINE FROM ITS MOUTH IN FT. SMITH, ARKANSAS

C.D. DOWELL, Arkansas Polytechnic College, Undergraduate School, *Russellville, Arkansas* 72802

The Arkansas River Navigation Project was opened from the Mississippi to Ft. Smith, Arkansas with the completion of the Ozark lock and dam in early 1970. This massive $2 1/2 billion U.S. Army Corps of Engineers project, which stretches 450 miles, will change the heartland of the American mid-south region. The social, industrial, economic and recreational posture of the area will be affected by the shoreline development and contingent complexes.

Following photographic techniques used by Shafer, the purpose of the study was to document the existing state of industrial, recreational, port and residential sites as identified in prior studies with a color photo slide base. Adequate visual data was furnished the Arkansas Planning Commission which can now mount a public information and education program for community and region decision-makers who may need documentation of existing uses or phases of specific shoreline areas. A token fly-over of the project area illustrated the utility of remote sensing applications to river basin planning.

SUPPORTED BY Arkansas State Government

1.0010, THE LIMNOLOGY OF LAKES FORMED BY BAUXITE STRIP-MINING OPERATIONS

G.L. HARP, Arkansas State University, Graduate School, *State University, Arkansas* 72467

The process of strip-mining coal commonly leaves pits which subsequently fill with water. These strip-mine lakes occupy over 65,000 acres of land in Arkansas, Missouri, Oklahoma, Kansas, and Iowa. Initially, many such lakes contain water contaminated with sulfuric acid formed from the oxidation of sulfur compounds associated with the coal. High concentrations of hydrogen ions severely limit the biota in such waters. The acid pollution may render the water and surrounding lands unproductive as regards fish, crops or grazing of domestic animals, for in excess of 50 years.

In contrast to the extensive literature concerning strip-mining for coal, no investigation has been conducted to date concerning the physicochemical or biological characteristics of strip-mine lakes resulting from bauxite mining. This process also results in acid water and polluted landscape.

The purposes of this study are to qualitatively and quantitatively describe the physicochemical characteristics and the aquatic flora and fauna of strip-mine lakes resulting from bauxite mining. Further, this information will be compared with that known concerning coal strip-mine lakes.

SUPPORTED BY Arkansas State University

1.0011, INVESTIGATION OF FISH DIVERSIFICATION AND DISTRIBUTION IN BIG CREEK AND ITS WATERSHED

G.L. HARP, Arkansas State University, Graduate School, *State University, Arkansas* 72467

Big Creek is a relatively small deltaic stream in Northeastern Arkansas. Of recent years it has been dredged in the interest of flood control for surrounding farm land. A dam near the headwaters also aids in this control. Lost Creek and Mud Creek are the major tributaries of Big Creek and collectively drain the Big Creek Watershed.

Only one prior investigation of fish population from Big Creek is known (Osoinach 1969). This survey was conducted two miles south of Jonesboro, Arkansas, in a one-half mile stretch of water. Case (1970) provides physicochemical data from two locations on Big Creek. Jackson (1968) studied the physichochemical and ichthyofaunal characteristics of Lost Creek, but no survey has been conducted on Mud Creek.

It is the purpose of this study to determine qualitative variation of fish populations in Big Creek, Mud Creek, and Lost Creek and the co- existing physicochemical conditions. Further, the effect of pollution resulting from the Jonesboro sewage effluent and Broadway Meat Packing Company waste on the fish population will be determined.

SUPPORTED BY Arkansas State University

1.0012, A PRE-IMPOUNDMENT INVESTIGATION OF THE STRAWBERRY RIVER

G.L. HARP, Arkansas State University, School of Liberal Arts, *State University, Arkansas* 72467

This study provides a record of the pre-impoundment limnological characteristics of the Strawberry River, a habitat-type which has had little investigation to date. Limnological procedures were standard.

The Strawberry River was characterized by high alkalinity and pH, low carbon dioxide and turbidity, and adequate oxygen values.

Plankton was characterized by limited numbers of Staurastrum, Rotatoria, and Gomphonema. Pool-riffle communities were ill-defined. Chironomidae, Oligochaeta and Ephemeroptera were dominant pool benthic macroinvertebrates among the 13 taxa collected. Of the 20 taxa collected in riffles, Trichoptera, Ephemeroptera, Simuliidae and Chironomidae were the most numerous. Longitudinal zonation was characterized by an increase in species and numbers of pool benthic macrofauna from headwater to downstream areas. Seasonal numerical maximum standing crop was recorded for pools on 8 June 1968 and riffles on 30 September 1967. A total of 1,979 fishes constituting 48 species were taken in this study. Station I and II pools yielded 604 and 463 fishes/acre respectively, Dorosoma cepedianum and Moxostoma erythrurum being the dominant forms. The substantial populations of Dorosoma cepedianum seemingly are supported by debris and allochthonous materials and not on the sparse plankton present. Station I and II riffles yielded 8,740 and 2,769 fishes/acre respectively, Etheostoma caeruleum and Percina caprodes being most numerous. Longitudinal zonation was characterized by a decrease in number/acre and species present from headwater to downstream areas.

SUPPORTED BY Arkansas State University

1.0013, SNOW HYDROLOGY STUDY TO EVALUATE WINTER RECREATION POTENTIAL OF HORSE MOUNTAIN SKI AREA

UNKNOWN, Humboldt State College, Graduate School, *Arcata, California* 95521 (CALZ0008)

Progress; During the winter of 1966-67, a continuous snow cover existed on Horse Mountain from November 30th until May 21st, with maximum snow depths occurring in April. During this period, snow depth was adequate to permit favorable skiing from February lst through May 15th. The area served a total of 2,200 skiers and 700 snowplayers during the 1966-1967 season. Snow quality was in excess of 90 percent from February 15th until April 30th, indicating inherent snow stability during this period. Mean snow depth and water content was respectively 70.3 and 24.3 inches at the weather station (elev. 4,820 ft.) in April. Statistical analysis of snow data from the study basins indicated no significant differences in snowfall accumulation and retention between basins. However, significant differences in snow retention existed on ski slopes relevant to aspect and slope steepness. For example, a northwest-facing ski slope with a slope steepness of 45 percent retained 40 percent more snow on May 14th than did another slope with the same aspect and a steepness of 20 percent. Basic snow data obtained in this study provided useful information on snow water storage in Humboldt County; information which has been essentially unavailable for the County to date.

SUPPORTED BY U.S. Dept. of Agriculture

1.0014, ATLAS OF EASTERN PACIFIC MARINE GAME FISHING

J.L. SQUIRE, U.S. Dept. of Interior, Bur. of Sport Fish. & Wildlife, *Belvedere - Tiburon, California* 94920

Objective: To revise Circular No. 174, which was developed originally from data collected in 1961 and 1962 and published in 1963. Revision will be conducted by first determining the major areas of marine game fishing, their approximate boundaries, and to obtain knowledge of the principal species caught in each of these marine areas. This information to be graphically displayed in a series of charts outlining the major marine fishing areas, with an appended species list of marine game fish commonly caught in eastern Pacific waters, information on optimum fishing times, and brief discussion of facilities available to the marine game fish angler.

Results to be provided to the public as general information. Specific research objective is to provide information for the planning of coastal programs in areas having considerable marine fish sampling to insure adequate information for the study of environmental and biological relationships of the major marine game species.

Procedure: 1. During 1970 contacts to be made with scientists and fishermen to determine areas and specific locations of fishing and seasonal distribution of marine fish and fishermen. 2. Utilizing these data, a series of charts will be drawn in color, outlining the areas of fishing and listing the species commonly taken. Appended to these charts will be a check list of approximately 250 marine game fish species taken by the marine game fish angler in the eastern Pacific. List will note their scientific names (family, genera and species), common name, and range, and will include a drawing of the more important species.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0015, CATCH TEMPERATURE RANGES OF SOME PELAGIC MARINE GAME SPECIES

J.L. SQUIRE, U.S. Dept. of Interior, Bur. of Sport Fish. & Wildlife, *Belvedere - Tiburon, California* 94920

Utilizing available sea surface temperature data obtained from Tiburon Marine Laboratory airborne infrared sea surface surveys for the period August 1963 to date, and sportfish catch and effort records available from the California Department of Fish and Game, and apparent abundance data from the Tiburon Marine Laboratory pelagic fish monitoring program; determine catch and apparent abundance temperature curves for major pelagic marine game species.

Description of Work: A. Select for each species geographical block areas where the species are commonly caught or observed. Area selection would be based on catch records of observed availability. B. Compile catch and observation data per selected block area/per month for species of interest. C. Determine by a 10 degrees Long. x 10 degrees Lat. grid monthly sea surface temperature for geographical block areas selected (A). D. Using data from Items B and C, compute mean catch temperature and standard deviation for each species and fishing or observation area. E. Plot catch and observation temperature curves for each species for each major fishing area. F. Compare observations of the two types of data (catch and observation) in relation to seasonal, and geographical occurrence and develop conclusions on the importance of sea surface temperature to fishing success.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0016, USE OF REMOTE SENSING IN WATER RESOURCES MANAGEMENT

R.I. WELCH, Earth Satellite Corporation, *Berkeley, California* 94704

In a continuing study of the use of Remote Sensing in Water Quality Control, studies have been undertaken to assess the recreation potential of coastal areas. Color and color infrared photography were used to evaluate areas for underwater parks and shoreline recreation.

A study is now underway to evaluate wildland watershed environments using remote sensing.

(This study is being continued by the investigator at Earth Satellite Corporation on a project started at Stanford Research Institute.)

SUPPORTED BY Earth Satellite Corp. - Berkeley, Calif.

1.0017, TETON NATIONAL FOREST VISUAL ANALYSIS

R.B. LITTON, U.S. Dept. of Agriculture, Pac. Sw. For. & Rg. Expt. Sta., *Berkeley, California*

To test the concept and application of landscape control points (LCP's), a framework of permanently established observation points from which the broad forest landscape may be recorded and from which proposed alterations may be studied. Visual alternatives are to be examined, leading to recommendations for those relationships which are most compatible to surrounding landscape.

To compare the results of direct visual mapping with the computer technique VIEWIT, using the same LCP's.

To analyze the conceptual framework of management alternatives which encourage or improve constraints upon viewer preferences and behavior.

SUPPORTED BY U.S. Dept. of Agriculture

1.0018, CHALLIS NATIONAL FOREST VISUAL ANALYSIS (LITTLE CASINO CREEK AREA)

R.B. LITTON, U.S. Dept. of Agriculture, Pac. Sw. For. & Rg. Expt. Sta., *Berkeley, California*

Development of a nonrouted or area inventory of landscape resources to which visual alternatives of timber cutting blocks and timber access roads may be related.

Techniques for recording visual landscape elements in related small areas (4500 acres) are to be developed.

This is a visually sensitive area, being adjacent to part of the boundary of the proposed Sawtooth Recreation Area.

SUPPORTED BY U.S. Dept. of Agriculture

1.0019, FOREST LANDSCAPE EVALUATION--LAKE TAHOE

F.L. NEWBY, U.S. Dept. of Agriculture, Pac. Sw. For. & Rg. Expt. Sta., *Berkeley, California*

Phase I: 1. Review literature, develop bibliography; 2. Assembly of existing mapped data for entire Lake Tahoe Basin developing a set at a common scale depicting geology, soils, vegetation, climate, land use history; 3. Summarize interrelationships and development and conservations implications. 4. Conduct visual/spatial evaluations using topographic maps by limited field observations. 5. Summarize data at basin scale. 6. Coordinate environmental data with inter-state, regional and local agencies having policy-making responsibilities within the basin.

SUPPORTED BY U.S. Dept. of Agriculture

1.0020, GUIDES FOR FOREST LAND MANAGEMENT UNDER ACCELERATED RECREATION DEMANDS AND INTENSIVE LAND USE

F.L. NEWBY, U.S. Dept. of Agriculture, Pac. Sw. For. & Rg. Expt. Sta., *Berkeley, California* (PSW1901)

OBJECTIVE: Clarify and study the problems of planning and managing forest lands where there are accelerating land-use pressures and intensive recreation demands.

APPROACH: Study will be made of the principles of analyzing scenic aspects of resources, campground ecology, trends in the use of campgrounds and other intensively used sites, what forest recreation visitors seek and how they are affected by crowding or land management changes, improvement in plantings and horticultural treatments on forest recreation areas and integration of forest recreation with general resource or economic development.

PROGRESS: Principles of regional landscape design have been clarified and made more useful to resource planners and managers. Objective measures of visibility such as distance, angle of view, and observer position have been field tested. We have also illustrated the merits of careful delineation of scenic zones in areas of high commercial timber value; one case study showing that of about 60,000 acres of forest visible from a recreation highway, about 80% was not of critical importance as determined by landscape analysis, and would require minimum recognition of the visual by-products of commercial development of timber and other resources. Evaluation of plants and horticultural treatments for recreation sites is leading to planting and maintenance programs that are more successful and efficient, yet at the same time keyed to the natural ecology. Studies in cooperation with Forest Disease Research are reducing hazards from trees in recreation sites, and helping preserve the very trees which by their size and form are most valuable from an esthetic and recreational point of view. Management alternatives have been identified with the aid of computer systems analysis, especially in the case of recreation facility additions and visual zoning decisions. Qualitative inputs are being synthesized in an interdisciplinary approach to environmental planning problems.

SUPPORTED BY U.S. Dept. of Agriculture

1.0021, VEGETATION MONITORING AT MINERAL KING

UNKNOWN, U.S. Dept. of Agriculture, Pac. Sw. For. & Rg. Expt. Sta., *Berkeley, California*

To record vegetation and soil conditions prior to the development of a recreation area, proposed for intensive use, as a basis for evaluating habitat changes and suggesting protective and corrective management through periodic monitoring of habitat conditions.

SUPPORTED BY U.S. Dept. of Agriculture

1.0022, LAKE ALMANOR ANGLER USE AND HARVEST

J.A. HANSON, State Dept. of Fish & Game, *Chester, California* 96020

Objectives: 1. To determine the contribution of naturally produced game fishes to the fishery. 2. To evaluate the contribution of stocked salmonids to the sport fishery and to determine optimum stocking sizes and rates.

Job Objectives: 1. To determine total angler use. 2. To determine total harvest by species. 3. To determine catch-per-hour by species.

Procedures: Total angler use and harvest will be estimated by a creel census at Plumas Pines Resort and a coordinated use count of the entire lake made from a boat. The census at Plumas Pines will be conducted on one weekday and both weekend days each week. Holidays will be included with weekend days. Weekdays to be censused will be chosen systematically. The census day will begin at 8 a.m. and continue until the last angler has returned. All anglers returning to the dock will be interviewed to determine the number of hours spent fishing, number of fish caught by species, and the area fished.

Use counts will be made each scheduled census day from a boat. At least one count will be made in the morning and one in the afternoon. All anglers will be counted and those not originating from Plumas Pines Resort will be interviewed. Those originating from Plumas Pines Resort will be tallied separately. All fish will be weighed and measured.

Average angler-hours per day for the weekday and weekend day strata will be calculated monthly for Plumas Pines Resort anglers, and multiplied by the total days in the stratum to give total monthly angler-hours at Plumas Pines. The percentage of all Lake Almanor anglers originating from Plumes Pines will be estimated from the use count. The total angler-hours will then be estimated for each month by dividing the total Plumas Pines angler-hours by the percentage of all anglers originating from Plumas Pines.

Monthly estimates of total angler-hours will be multiplied by catch-per-hour for each species to estimate total catch by species.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0023, VEGETATION MANAGEMENT

R.W. HARRIS, Univ. of California, School of Agriculture, *Davis, California* 95616

To study and develop horticultural methods for planting, managing, and enhancing vegetation on outdoor recreation sites. Particular effort is developing techniques and finding tree and shrub species that can be established by seeding directly at the site. Ecotypic selection and screening within the more promising native and exotic species are important phases of the study. Research plots are located at 20 sites throughout California.

SUPPORTED BY U.S. Dept. of Agriculture

1.0024, BEHAVIORAL STUDIES OF REEF-ORIENTED SPORT FISHES

J.M. DUFFY, State Dept. of Fish & Game, *Long Beach, California* 90802

Objectives: To determine behavioral patterns of southern California reef-oriented sport fishes which may affect their availability to sport fishermen.

Job Objectives: To make in situ observations of various behavioral patterns (breeding, schooling, feeding) of five important 'reef dependent' sport fishes (sculpin, Scorpaena guttata; kelp, sand, and spotted sand bass, Paralabrax clathratus, P. nebulifer, and P. maculatofasciatus; and sheephead, Pimelometopon pulchrum). The effect of various behavioral patterns on each species' availability to sport fishermen will be determined, as will each pattern's relation to current or proposed management practices.

Procedures: Project diving biologists will make in situ observations of the five species during at least 2 days each month. Diving observations will be made, photographs will be taken and analyzed, and fish movements will be studied and correlated with catch data obtained from the Department's Biostatistical Section. Field work will be conducted in promising areas of southern California where feeding, breeding, schooling, and other aspects of each species' social life can be observed and documented.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0025, DETERMINATION OF SPORT FISH POPULATIONS AROUND EXISTING MAN-MADE STRUCTURES

J.M. DUFFY, State Dept. of Fish & Game, *Long Beach, California* 90802

Objective: To determine the effects of man-caused modifications on southern California nearshore marine sport fishes.

Job Objectives: 1. To conduct scuba diving surveys around man-made fishing reefs and offshore oil drilling platforms to identify and enumerate the fish species and other organisms inhabiting these areas. 2. To determine the effects of these structures on the availability and catchability of local sport fishes.

Procedures: Scuba dives will be conducted around the various existing offshore oil drilling platforms and islands and the offshore and nearshore man-made reefs (about 30 structures) to determine their current attractiveness to sport fishes. Sport fish populations and general biotic communities encountered in each area will be assessed, employing the techniques described in 'Artificial Habitat in the Marine Environment,' by Carlisle, Turner, and Ebert (1964, California Dept. Fish and Game, Fish Bulletin No. 124, 93 p.) and in 'The Marine Environment Offshore from Point Loma, San Diego County' by Turner, Ebert, and Given (1968, California Department of Fish and Game, Fish Bull. No. 140, 85 p). The data gathered will be used to evaluate these structures as a means of increasing sport fish numbers and the sport catch. Semi annual or quarterly surveys will be made, as appropriate, of the various structures throughout the study period.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0026, FISHING REEF SURVEY AND SITE SELECTION

J.M. DUFFY, State Dept. of Fish & Game, *Long Beach, California* 90802

Objective: To determine the effects of man-caused modifications on southern California nearshore marine sport fishes.

Job Objective: To evaluate proposals for the construction of artificial fishing reefs in relation to their potential for enhancing nearshore sport fish populations.

Procedures: After the Department receives a request to authorize construction of a fishing reef, and before obtaining the necessary permits, project diving biologists will survey each proposed area and select the most suitable construction sites. Bottom relief, bottom composition, water depth, and the proximity of natural reefs to each site will be considered in this selection. Once selected, visual observations of animal and plant life present in the area will be made along 100-m transect lines to ascertain conditions at the site before construction. Predictions will then be made of the effects of reef construction on the proposed area. Diving surveys will be made 1, 3, 6, and 12 months after construction is completed to check the progressive buildup of sport fish populations around the new reef. The survey techniques employed will follow those described in 'Artificial Habitat in the Marine Environment,' by Carlisle, Turner, and Ebert (1964, Calif. Dept. of Fish and Game, Fish Bulletin No. 124, 93 p.).

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0027, INSHORE FISHERIES HABITAT EVALUATION AND MONITORING

A.R. STRACHAN, State Dept. of Fish & Game, *Long Beach, California* 90802

This broad-based study will provide necessary guidelines for the protection and enhancement of nearshore areas with respect to the rapidly increasing activities of man, thereby aiding the Department in achieving its four stated objectives. Specifically, the major objectives of this Habitat Evaluation and Monitoring Program will be: (1) to document the present status of the nearshore marine animals and plants of California, their habitat, and needs in order to establish a basis for sound management policies relating to these living resources; and (2) to monitor, evaluate, and document changes to the biota, the environment, or both, as a direct or indirect result of man's activities, and to recommend action that will remedy situations that are found to be deleterious to the best interests of all concerned.

A general reconnaissance will be made of selected areas of the coast from the intertidal to 100-foot depths. The team of skilled biologists-divers will survey and map the geography of this subtidal zone. Notes, photographs, and reference bearings will be made. The small boats required in these operations will follow the divers as they survey the submarine topography, and will be used in taking bearings on terrestrial landmarks so the areas may be revisited.

These biologist-divers will also work on the backlog of contract surveys the Department has been requested to undertake, and conduct such immediate surveys (fire fighting surveys) that may be required of the Department during the fiscal year.

SUPPORTED BY California State Government - Sacramento

1.0028, ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION

J.R. GOODIN, Univ. of California, School of Agriculture, *Riverside, California* 92502

The proposed research involves utilization of reclaimed municipal sewage effluent to irrigate a greenbelt for fire protection, recreation, groundwater recharge, improved wildlife habitat, and increased forage production for livestock. The ecological and physiological implications of applying unusual quantities of water and nutrients to Mediterranean- type vegetation in attempting to bring about these benefits will be a prime consideration.

The Maloney Canyon project area is located near Lake Arrowhead in the San Bernardino Mountains. Reclaimed sewage effluent goes through final settling in basins located at the upper level of the project area. We propose to construct an irrigation system, experimental in design, with a main line extending approximately two miles from the effluent ponds along natural contours so that all water flow will be gravitational. Gate valves along this main will control individual replications for irrigation treatments, allowing the application of 1, 2, and 4 inches of supplementary water each week.

In addition to ecological changes brought about by the new environment, we propose to study the imposition of this changed environment upon introduced grasses, trees, and shrubs which may have fire protection, recreational, and wildlife value.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0029, INFLUENCE OF SUBSURFACE WASTE DISPOSAL SYSTEMS ON RECEIVING WATERS

K.D. KERRI, Sacramento State College, School of Engineering, *Sacramento, California* 95819

Recreational facilities and other rural locations frequently rely on subsurface waste disposal systems. The desirability to live near impoundments in remote regions without wastewater collection systems has attracted numerous developments to meet the leisure demands of society. The objective of this research project is to develop prediction models capable of indicating the influence of existing and proposed sub-surface waste disposal systems on receiving waters. Nutrients contributing to the eutrophication of impoundments will be of primary interest. Factors influencing the nutrient load on impoundments and possibly incorporated in the prediction model include chemical and physical properties of soils, depth to water table, rate of groundwater movement, stage of nutrient cycle, and contributing sources.

SUPPORTED BY Sacramento State College - Calif.

1.0030, RENOVATION OF WASTE EFFLUENT FOR RECREATION AND POTABLE WATER SUPPLY USES

E.W. HOUSER, Santee County Water District, *Santee, California* 92071

The immediate objectives of the project are to demonstrate that the effluent from a recently constructed activated sludge plant can be treated through biological, mechanical, and chemical means so that the resulting effluents can then be safely used for body contact sports and other recreational activities. It will also demonstrate the elimination of bacteria and viruses. The value of this project is enhanced by the environmental characteristics of the area. Santee is an arid region, having high rates of evaporation and a water supply shortage. At present, shortage is met by importing water. With increasing populations and rising costs of imported water, Santee and other similar communities must develop supplemental water supplies for potable and recreational uses. Treated sewage effluents, when filtered through natural ground aquifers can be reused in lakes for body-contact sports and other recreational activities, based on purification standards and of general public acceptance. By cautiously approaching this acceptance and using the most advanced treatment techniques this project can demonstrate that man-made processes can achieve the same acceptance and purity requirements.

SUPPORTED BY U.S. Dept. of Interior - F. Wtr. Qua. Adm.

1.0031, ENVIRONMENTAL MODIFICATION ASSESSMENT

C.H. TURNER, State Dept. of Fish & Game, *Terminal Island, California* 90731

Objectives: To survey areas of existing or proposed man-made modifications to the marine environment (e.g., man-made fishing reefs, offshore oil drilling platforms, sewage outfalls, etc.) to assess their effect on sport fishes and related marine life.

Procedures: Survey dives will be conducted around the various existing offshore oil drilling platforms and islands and the offshore and pier man-made reefs (about 30 structures) to determine their current attractiveness to sport fishes. Sport fish populations and general biotic communities encountered in each area will be assessed. Data gathered will assist in evaluating these structures as a means of increasing sport fish numbers and the sport take. Because the structures vary in size and complexity, it will be difficult to assign a fixed amount of time to each. Approximately one week per month will be scheduled for these activities.

Survey dives will be conducted in areas where sewage outfalls, or other man-made modifications to the environment, exist, or are proposed, to determine, or predict, their impact on the biotic assemblages typical to each area. In general, a modification of the usual transect-quadrat method of terrestrial ecological study will be used.

This method involves the use of measured linear areas (extending perpendicular to shore) from the intertidal area to depths of 100 feet. At selected points along this transect, random casts of a quadrat are made and the biota within the quadrat periphery are enumerated and identified. Various sub-samplings of the biota and physical measurements of the water column and substrate will be made as the situation dictates.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0032, TOURISM AND OUTDOOR RECREATION PLAN FOR ONTARIO

P. KLOPCHIC, Kates Peat Marwick & Company, *Toronto - Ontario, Canada*

1. A master Tourist and Outdoor Recreation plan for Ontario will be developed. The Plan will include the evaluation of tourist and outdoor recreation needs and resources of Ontario and recommended policies and action programs. The plan will be prepared in accordance with the following policy guidelines. 2. The objective of this Master Tourism and Outdoor Recreation Plan is to provide the Government of Ontario with guidelines for the use of provincial resources-natural, human, and financial - in order to serve the growing recreation and tourist facilities requirements of the people of Ontario and of visitors to the province.

Interim Reports are available from Dr. Peter Klopchic.

SUPPORTED BY Ontario Provincial Government

1.0033, SPACE STANDARDS FOR OUTDOOR RECREATION-GULF ISLANDS RECREATIONAL SURVEY

H.P. OBERLANDER, Univ. of British Columbia, *Vancouver - British Columbia, Canada*

Problem: To determine space standards for outdoor recreation; to relate the increasing pressures for outdoor recreation placed on a rapidly urbanizing area and the natural environment's capacity to sustain intensive human use. The shrinking work day and work week, early retirement, and a longer life have enabled man to devote more time to recreation. Thus, it will have to be determined how much and what kind of outdoor space ought to be set aside in perpetuity for more and increasingly intensive recreational use.

Method: The project will attempt to test its observations and criteria for space standards in the context of recreation opportunities in the Gulf and San Juan Islands. These islands will serve as an outdoor laboratory for the test phase of the project.

SUPPORTED BY William H. Donner Foundation Incorporated

1.0034, AN ANALYSIS OF THE EFFECTS OF WATER LEVEL FLUCTUATION ON SHORELINE RECREATION

R. JAAKSON, Univ. of Waterloo, *Waterloo - Ontario, Canada*

The focus of the study consists of an analysis of the effects of water level fluctuation (predominantly water level draw-downs) on water- oriented recreation. The research will converge to identify a causality between water level fluctuation and the serviceability of a water- oriented recreation environment to accommodate recreation activity, especially activity generated from shoreline summer cabin developments. Research will be channeled to identify the consequences of water level fluctuation (1) on the quantity of recreation activity: visitation by residents and non-resident day-users, and (2) on the quality of recreation activities: the usability of beaches, the presence of boating hazards, land-water access problems, and the attitude of recreationists to the water environment. The effects of water level fluctuation on the physical manifestation of recreation activities will also be researched: the relationship between water level fluctuations and shoreline fixtures (decks, boathouses), real-estate factors such as re-saleability of property, assessment and rate of development.

SUPPORTED BY Ontario Provincial Government

1.0035, SOUTH PLATTE RIVER DEVELOPMENT PLAN

G. STENSON, S.R. Deboer & Company, *Denver, Colorado* 80200

This program is designed for the Recreational development of the South Platte River bottoms below the proposed Chatfield dam and past the city of Littleton and Belleview Ave.

The plan proposes: A. Bridle path along the edge of the river connecting with Centenniel race track. B. Bicycle path along the whole length of the river. C. Fishing lakes at various spots together with a fish hatchery. D. A large area for an Arboretum. E. Many areas for picnicking and a tree planted park road along the full length of the river.

SUPPORTED BY U.S. Dept. of Interior - Bu. Outdoor Rec.

1.0036, GEOLOGICAL STUDIES - NORTHERN PARK RANGE II

G.L. SNYDER, U.S. Dept. of Interior, Geological Survey, *Denver, Colorado* 80225

State to which the work listed herein pertains: Colorado

Major objective: A broad understanding of local Precambrian, Mesozoic, and Tertiary geologic history and its bearing upon the scientific, economic, and recreational environmental needs of the United States. Although this project is actually a continuation of Park Range I, field work has not yet begun within the area of Park Range II. Within the next 5 years I hope to complete: 1. Reconnaissance bedrock and surficial geologic maps concentrating on the Precambrian parts of Park Range I and II, plus enough reconnaissance of the Sierra Madre Range of Wyoming to link up with R. Houston's Medicine Bow Range work. 2. Reconnaissance geochemical maps of Park Range I and II areas on which to base an informed Mount Zirkel Wilderness Area report. 3. Appropriate Precambrian Geochronological work and reports in conjunction with Isotope Geology. 4. Special topical reports as the occasion arises. 5. Petrologic and chemical studies in support of the above. 6. At least one remaining topical study associated with New England bedrock work.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

1.0037, EVALUATION OF FOREST OPENINGS

R.S. BILLARD, State Board of Fish. & Game, *Hartford, Connecticut* 06115

The purpose of this job is to develop techniques suitable for measuring the effect of Forest Management work that has been carried out over the past 20 years under Pittman-Robertson financed development projects and to develop a rating system which will be useful in evaluating the potential value of small (under one acre) artificially created herbaceous openings.

The job is broken into 6 phases: 1. Literature search. 2. Development of techniques for measuring wildlife use on the openings. 3. Development of techniques for measuring the quality of wildlife foods produced. 4. Application of techniques developed under 2 and 3 to a number of herbaceous openings. 5. Determination of the vegetative types - ages and combinations - that afford the best potential for wildlife use. 6. Preparation of a rating system that can be used in the field to score the quality of the herbaceous openings.

The project was initiated in January 1970.

The project is scheduled for completion in June 1971.

Summary: The purpose of the job is to develop a scoring system that will enable us to measure the value of the forest land habitat improvements we have.

SUPPORTED BY Connecticut State Government

1.0038, BIOGEOCHEMICAL RELATIONSHIPS IN A MARITIME FOREST: FIRE ISLAND, NEW YORK.

H.W. ART, Yale University, School of Forestry, *New Haven, Connecticut* 06520

This study involved the quantitative and qualitative investigation of cations in the Sunken Forest ecosystem: precipitation inputs, throughfall, stemflow, standing biomass, litterfall, soil system and ground water. The results have been interpreted in light of the total barrier island environment and in contrast to other terrestrial ecosystems in which similar investigations have been undertaken.

SUPPORTED BY U.S. Dept. of Interior - Natl. Park Serv.

1.0039, BARRIER BEACH ECOSYSTEM ANALYSIS

H.W. ART, Yale University, School of Forestry, *New Haven, Connecticut* 06520

This project is a qualitative and quantitative study of the vegetation and sea-atmosphere-soil-vegetation nutrient relationships in the Fire Island National Seashore Sunken Forest. The summer of 1967 is to be spent in the investigation of methods of collection, analysis, and delimitation of the study. Specific projects include: (a) a vegetational analysis of the barrier beach from the ocean, through the Sunken Forest and to the Great South Bay, and (b) initiation of a long- term study of quantitative and qualitative nature concerning the marine, atmospheric, biotic and edaphic nutrient sources for the barrier beach ecosystem.

SUPPORTED BY U.S. Dept. of Interior - Natl. Park Serv.

1.0040, THE ROLE OF THE FOREST IN OPEN-SPACE PLANNING IN EASTERN CONNECTICUT

M.J. GRATZER, Univ. of Connecticut, Agricultural Experiment Sta., *Storrs, Connecticut* 06268 (CONS00390)

Study I. Inventory of Open Spaces - Objective: Determine the quality and quantity, distribution, ownership patterns of forest resources and other open space resources.

Approach: Search of town records, aerial photo and map identification, field sampling and data computation.

Progress: 44 square miles (3079 individual parcels) coded and tabulated.

Study II. Quantitative Landscape Preference Model - Objective: Establish quantitative landscape description model. Test public preference for various types of landscapes.

Approach: Photographic inventory of study area. Rating and grading landscapes according to components. Development of model. Testing of model, and identification of preferred components through interviews. Study to be duplicated in Montana to test regional differences.

Progress: All data collection completed.

Study III. Perception of landscapes as Measured by an Eyemovement Recording System - Objective: Probe the applicability of eyemovement recording systems for forest recreation -- open space planning research.

Approach: Testing of instruments; recording eyemovements of respondents over various landscape photographs; identification of fixation points.

Progress: Instrumentation completed. Eyemovements of eleven respondents over eleven photographs completed.

SUPPORTED BY U.S. Dept. of Agriculture

1.0041, RECREATION IMPLICATIONS OF NATIONAL PRIORITIES IN MARINE SCIENCES

A.B. BIGLER, Marine Technology Society Inc., *Washington, District of Columbia* 20005

The five major marine program areas announced by the Federal Government are significant to the fuller utilization of ocean resources for recreation purposes. Objectives for coastal zone development, regional coastal laboratories, lake restoration, Arctic environmental research, and the International Decade of Ocean Exploration should include development of data and management systems of significance to recreation activities. Presently such considerations appear to be receiving inadequate attention.

SUPPORTED BY No Formal Support Reported

1.0042, A MULTIDISCIPLINARY APPROACH FOR STIMULATING NEW CAREERS IN RECREATION AND PARKS FOR THE HANDICAPPED

D.R. DUNN, Natl. Recreation & Park Assn., *Washington, District of Columbia* 20006

This project was conceived as a result of previous research findings which demonstrate that there is a manpower shortage in the recreation and park field, that handicapped persons are virtually an untapped reservoir of potential manpower in America, that handicapped persons can contribute substantially to manpower required in the recreation and park field, and further, that an interdisciplinary communications chasm is inhibiting the efficient use of handicapped individuals in the recreation and park field.

The project will enable eight district workshops to be held during the first half of 1971, following a planning session task force which will meet in Denver, Colorado in September, 1970.

The overall purpose of the project is to stimulate awareness among all potential contributory segments, and to provide guidelines for the development of (a) new career opportunities for the handicapped, and (b) new career opportunities in rehabilitation in the recreation and park field.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - S.R.S.

1.0043, ANALYSIS OF URBAN OPEN SPACE AND RECREATION REQUIREMENTS AND DEVELOPMENT OF CRITERIA FOR MEETING HIGH DENSITY NEEDS

D.R. DUNN, Natl. Recreation & Park Assn., *Washington, District of Columbia* 20006

This project will permit NRPA to conduct an indepth study of urban open space and recreation requirements in core areas of 25 major American cities (Philadelphia, Boston, Newark, Rochester, Atlanta, Memphis, New Orleans, Tampa, Birmingham, Norfolk, Detroit, Milwaukee, Kansas City, Dayton, Minneapolis, Louisville, Houston, Denver, San Antonio, Oklahoma City, Phoenix, Los Angeles, Seattle, Portland, and Oakland).

Objectives of the study are: 1. The establishment of guidelines on the desired level of facilities based on an analysis of the information obtained from low-income census tracts in the cities, supplemented by data NRPA gathers for its 1970 Yearbook, and socio- economic data from the 1970 national census. 2. Identification and evaluation of models of park and recreation management systems that have delivered services to the inner-city clientele with appreciable success. 3. The determination of the level and type of citizen participation in planning and implementation and ascertainment of how effectiveness can be increased. 4. Determination of the future demands which will be made on local resources and grant-in-aid programs based on open space planning and capital programming.

SUPPORTED BY U.S. Dept. of Housing & Urban Development

1.0044. NATIONAL LAND USE INVENTORY

P. OT[illegible], U.S. Dept. of Agriculture, Natural Resource Econ. Div., *Washington, District of Columbia* 20250 (NRE1-1-54-00-A)

OBJECTIVE: Provide a continuing inventory of major uses of land by States and regions, and develop new techniques for compiling land use information.

APPROACH: Data is collected from various sources, analyzed, and summarized to provide a continuing inventory of the amount of land in crops, pasture and range, forest, urban and industrial use, highways, airports, parks, and other uses. Land classification techniques are developed. Experimental techniques for obtaining land use data, such as remote sensing, are tested and evaluated.

PROGRESS: The 5-year inventory of major land uses, based on the Census of Agriculture, has been completed for 1964. Work is beginning on the 1969 inventory. Annual data on cropland use are currently being obtained through the SRS Enumerative Survey. A study of the extent and nature of urbanization of land in the Western States based on airphoto interpretation has been completed and a report published. An analysis has been made of cropland abandonment and development of new cropland during the period 1944 - 1964 and a report published. An inventory using airphoto interpretation is currently underway of land clearing in the Lower Mississippi Delta. A study has been initiated evaluating alternative methods for rehabilitating areas disturbed for strip mining in Appalachia. An analysis is underway of the quantity and quality of land within SMSA's, type of cropland production, and potential impacts of urbanization.

SUPPORTED BY U.S. Dept. of Agriculture

1.0045, WILD AND SCENIC RIVERS STUDY

A.H. UNDERHILL, U.S. Dept. of Interior, Bureau of Outdoor Recreation, *Washington, District of Columbia* 20240

On October 2, 1968, the 90th Congress authorized a new concept in water resources management with the establishment of the National Wild and Scenic River System as outlined in the Wild and Scenic Rivers Act, (P.L. 90-542). Because certain of America's rivers possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural and other similar values, Congress declared that they should be preserved in their free-flowing condition for the benefit of present and future generations.

In addition to designating all or parts of eight rivers as initial components, Congress named 27 other rivers to be studied within the next ten years for possible inclusion in the National Wild and Scenic River System. The Secretary of the Interior has delegated to the Bureau of Outdoor Recreation the Department's responsibility in these studies. Since some of the 27 rivers will involve lands under the jurisdiction of the Department of Agriculture as well as the Department of Interior, the Forest Service has been named to coordinate river studies with BOR where Department of Agriculture lands are involved. Accordingly, the Department of Interior will take the lead in 18 river studies while the Forest Service will study the remaining nine. In addition, the several States involved in these river areas will also be included as participants in the studies. Based on the results of the studies, all or parts of each river will be classified, designated, and administered as a wild scenic or recreational river.

SUPPORTED BY U.S. Dept. of Interior - Bu. Outdoor Rec.

1.0046, HURRICANES AND THE ECOLOGY OF COASTAL VEGETATION IN SOUTHERN FLORIDA

F.C. CRAIGHEAD, U.S. Dept. of Interior, National Park Service, *Homestead, Florida*

On September 9 and 10, 1960, Hurricane Donna struck the southern and western coast of Everglades National Park. Studies have revealed less damage to animal populations than was expected and quick recovery of most populations. In the case of vegetation, however, damage has proved to be even greater than was originally thought, and little recovery is yet apparent. Over an area of 300 to 500 square miles, the landscape and vegetation has suffered extreme alteration. A thorough investigation of hurricane effects upon vegetation and present environmental characteristics of the damage area is urgently needed. This study should lead to a general theory of the ecological role of hurricanes and to predictions regarding vegetation recovery which is important to the planning and management of this portion of the Park.

SUPPORTED BY U.S. Dept. of Interior - Natl. Park Serv.

1.0047, VEGETATION CHANGES IN RELATION TO WATER LEVELS IN THE FRESH WATER COMMUNITIES OF THE EVERGLADES NATIONAL PARK

F.C. CRAIGHEAD, U.S. Dept. of Interior, National Park Service, *Homestead, Florida*

Compile and interpret observations of the past 10 year's results that have a bearing on the changes in vegetation from lack of water or the effects of too much water. Only about 1/3 of the Park, the Shark River Slough, is dependent on water from north of the boundary (Tamiami Trail). The remainder of the area is higher land the vegetation of which is dependent on rainfall or estuaries.

Two reports have been prepared: 'A Preliminary Report on the Closure of the Culverts Along the Mangrove Area of the Flamingo Highway and some observations on the effects of the Changing Water Levels on Wildlife and Plants (mimeographed).' Craighead, F.C. and Max Holden, August 1965.

Mimeographed paper presented at the February 1969, Water Resources Meeting, Everglades National Park. 'Some Biological Aspects of the Water Situation in the Everglades National Park.'

SUPPORTED BY U.S. Dept. of Interior - Natl. Park Serv.

1.0048, VEGETATION AND RECENT SEDIMENTATION IN THE MANGROVE AREA OF SOUTH FLORIDA

F.C. CRAIGHEAD, U.S. Dept. of Interior, National Park Service, *Homestead, Florida*

Nearly one half of the land area of the Everglades National Park is of recent origin, 5000 to 7000 years. It is composed of mineral and organic sediments practically all of which has been deposited by plant and animal activities. These deposits have been laid down with and preserved by the rising sea. The vegetation responsible for these deposits has changed frequently from catastrophic agencies such as hurricanes and fires. Each has left a distinct stratum in the profile of the overburden.

Several reports have been issued. 'Vegetation and Recent Sedimentation in the Mangrove Area of South Florida' - In the Proceedings of the Second Meeting on Natural Science Research conducted in the Everglades National Park and the South Florida Region. Sponsored by the Office of Natural Science Studies. Everglades National Park, July 18-19, 1968 (page 17 to 25) copies available from the office of Natural Science Studies, Everglades National Park.

'The Vegetation and Sedimentation of the Whitewater Bay Drainage System of the Everglades National Park,' September, 1967 - mimeographed. This is part of a productivity study of the mangrove swamps supported by the Bureau of Sport Fisheries and Wildlife in cooperation with the Marine Institute, University of Miami. Their part of the project has not been completed.

'Florida Submergence Curve Revised: Its Relation to Coastal Sedimentation Rates' Science Vol. 163 - February 7, 1969 - Scholl, David W. and F. C. Craighead, Sr., Minze Stuiver, Yale Radiation Laboratory, New Haven, Conn. 06520. (Reprints available)

SUPPORTED BY U.S. Dept. of Interior - Natl. Park Serv.

1.0049, RESEARCH ON THE BEHAVIOR AND SENSORY PHYSIOLOGY OF SHARKS

A.A. MYRBERG, Univ. of Miami, School of Marine Science, *Miami - Coral Gables, Florida* 33149

The acoustic biology of sharks is one objective of this research program. Emphasis will continue to be directed at the lemon shark, 'Negaprion brevirostris'; however, other species will be studied as they appear in areas where field studies are underway. The above phase of our program has four specific goals: 1) role of pressure and displacement reception in elasmobranch hearing, 2) clarify the biological significance of natural sounds in the sea to free-ranging lemon sharks, 3) determine most effective frequency bands and pulse repetition rates for purposes of attracting various species of reef and 'blue-water' sharks, and 4) clarify the effects of swimmer-generated sounds on the behavior of such sharks.

A second objective is to characterize locomotor activities of certain inshore sharks. This phase will emphasize the various species- typical motor patterns exhibited by species such as the bonnethead, 'Sphyrna tiburo', and/or the blacknose, 'Carcharhinus acronotus'. Analysis will cover diurnal fluctuations in various of these patterns.

Observations during this latter phase will continue on sharks present in a large semi-natural tidepool at the Miami Seaquarium. This particular colony is in excellent condition and the Management of the Seaquarium has been most cooperative in aiding us in this work. The first phase will consist mainly of field work, using the floating video- acoustic laboratory, R/V Observer.

This project is on-going and completion should be on 31 August, 1971.

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0050, TOPOGRAPHIC MAPPING, BY BIOLOGICAL MEANS, OF COASTAL MARSH IN EVERGLADES NATIONAL PARK

D.C. TABB, Univ. of Miami, School of Marine Science, *Miami - Coral Gables, Florida* 33149

Everglades National Park is exceedingly flat with more than half of its land area less than three feet above mean sea level. Rises in elevation of six inches constitute drainage divides, determine the depth and duration of flooding, vegetation types, and the types of soils. In a land so flat a contour map on the two inch contour is indispensable of the periphyton zone (a collective term for a community of algae, diatoms, and calcite crystals on plant stems, etc.) above ground surface to indicate differences in depth of surface flooding. Through various plotting and mapping procedures, a topographic map was produced.

The mapping has shown that red mangroves are found from the sea shore to elevations of about 21 inches above mean sea level while dwarfed cypress trees of the coastal plain occur in a zone 27 to 29 inches above mean sea level where calcium carbonate marl soil intergrades with outcroppings of base rock known as Miami oolite.

The mapping also confirmed, in essential detail, the presence of old storm ridges and natural levees built by red mangroves which, when undisturbed by fire, form natural impoundments of fresh-to-brackish water. The largest of these has been called Taylor or Madiera Slough. The top of the natural levees is roughly two feet above mean sea level. Impoundment behind this levee at full stage is between 5 and 11 inches deep.

The mapping provides clues to the probable effect of man-made changes in water runoff characteristics from both the biological and engineering standpoint.

SUPPORTED BY U.S. Dept. of Interior - Natl. Park Serv.

1.0051, INVENTORY AND ATLAS OF GULF COAST SPORT FISHING FACILITIES

N.G. VICK, U.S. Dept. of Interior, Bureau of Sport Fish. & Wlfe., *Panama City, Florida* 32401

A complete inventory of fishing facilities and fishing areas for the coast of the Gulf of Mexico from Brownsville, Texas to Key West, Florida will be made. All available reports and brochures on salt water sport fishing will be obtained through the circulation of a facilities checklist to recreational and fishing committees of chambers of commerce in coastal communities. Field trips will be made to confirm and add to the data obtained through correspondence. The results will be reviewed by State Conservation agencies for accuracy and completeness. The information will be published as a single atlas consisting of unit maps which together will cover the whole coast.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0052, RECREATIONAL IMPROVEMENT OF ETANG DE BERRE

UNKNOWN, Sogreah, *Grenoble, France*

Study of possibilities offered by the bank of Etang de Berre for the creation of centers of water recreation, such as recreational beaches and ports.

SUPPORTED BY French Government

1.0053, GUERANDE SWAMP

UNKNOWN, Sogreah, *Grenoble, France*

Research to improve the area of saltmarsh located in the region of Baule-Croisic-Guerande including some technical characteristics, demography and socio-economics of the region. Research directed especially towards the establishment of embankments for urban areas and the creation of a plan for water recreation.

SUPPORTED BY French Government

1.0054, BEHAVIOR OF THE LITTORAL ZONE SOUTH OF GRANDE TERRE

UNKNOWN, Sogreah, *Grenoble, France*

General study of the behavior of the littoral zone south of Grande Terre in order to select the sites most favorable for the construction of recreational ports and beaches.

SUPPORTED BY Guadeloupe Govt. - Basse-terre, France

1.0055, RABBIT POPULATION RESPONSE TO SMALL FOOD PATCHES IN A PIEDMONT WOODLAND

J.H. JENKINS, Univ. of Georgia, Agricultural Experiment Sta., *Athens, Georgia* 30601 (GEO-0011-MS)

OBJECTIVE: Determine effect of supplementary winter grazing on rabbit populations in the absence of mammal predators. Determine the effect of rabbits on the environment in a large semi-natural situation and to differentiate these effects from that of deer. Determine the incidence of parasitism and disease on rabbits in a large enclosed and protected environment.

APPROACH: Enclosures have been set up to determine the effects of small winter pastures on the parasite burden in deer. Two enclosures will have one per cent of the land in improved winter pastures while two will be controls and completely forested. The rabbits will essentially be in a mammalian predator free environment. Determine the effect of rabbits on the environment which might be essential to the correct assessment of the impact of a high deer population on the available browse.

PROGRESS: These studies were designed to develop simple methods of increasing rabbit populations or availability for recreational purposes by determining the effect of additional food on rabbit populations; the health of the species in a highly protected environment; and better methods of census. The stocked area showed range overuse, increased external parasite burdens, and very little or no reproduction. This area has been compared with woodlands nearby. Three hundred rabbits have been collected to determine the normal breeding picture. This phase of the work has been financed by the Georgia Game and Fish Commission since rabbits in the Piedmont seem to be at an all time low. All rabbits have been checked for tularemia agglutinens. There is no evidence of recovery or immunity in the population. Predator interrelationships have been studied. A method of marking and tagging feces of rabbits using a radioactive isotope has been worked out - this may simplify census procedures under some conditions.

SUPPORTED BY U.S. Dept. of Agriculture

1.0056, STATEWIDE FISHERIES INVESTIGATIONS

J.R. NIX, State Game & Fish Commission, *Atlanta, Georgia* 30334

Studies of the 'hydrographic zones' will include adequate sounding, visual inspection, chemical analysis, and substrate sampling to determine depth, salinities, tide velocities, temperature, substrate type and enumeration of natural reefs. Pre-construction inventories will be made in proposed reef zones and additional zones. Those studied in the species resource inventory will coincide with these used in habitat studies.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0057, STATEWIDE FISHERIES INVESTIGATIONS

J.R. NIX, State Game & Fish Commission, *Atlanta, Georgia* 30334

A fishermen contact creel census, of proper statistical designs, will be conducted to determine the variety and abundance of marine species harvested by sportfishermen in the study area. Hydrographic illustrations of the 'general area' will be produced, it will be zoned and from each zone an enumeration made for each of the species harvested, the total number of fishermen, time fished, total harvest, total yield and the frequency and type of habitat from which various sport fish are taken. An index of the densities of small game species and forage species will be made simultaneously in the proposed reef zone and selected additional zones using trawls, baskets, or possibly other techniques.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0058, STATEWIDE FISHERIES INVESTIGATIONS

J.R. NIX, State Game & Fish Commission, *Atlanta, Georgia* 30334

Project data will be analyzed and presented in a technical publication.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0059, MARINE SPORTFISHING RELATED TO ARTIFICIAL INSHORE REEF PLANTING - EVALUATION OF EFFECTIVENESS OF ARTIFICIAL HABITAT (ABBREV)

J.R. NIX, State Game & Fish Commission, *Atlanta, Georgia* 30334

Creel census techniques and sampling will be employed in zones proposed in the species resource inventory to allow comparisons of altered and natural environments in any definite time period and will be repeated to determine temporal changes in the sportfish species abundance, total harvest, total yield, number of fishermen, fishing success, and in abundance of forage species and small game fish species.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0060, MARINE SPORTFISHING RELATED TO ARTIFICIAL INSHORE REEF PLANTING - EVALUATION UTILIZATION OF NATURAL AND ALTERED STUDY ZONES

J.R. NIX, State Game & Fish Commission, *Atlanta, Georgia* 30334

Periodic contact creel census will be conducted to determine man- days or fisherman trips of sport fishing at planted reefs and utilization of adjacent study areas. Contacts will also be made with marinas, sport fishing clubs, boat camps and docks to evaluate fishermen utilization and success at the reefs.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0061, STATEWIDE FISHERIES INVESTIGATIONS

J.R. NIX, State Game & Fish Commission, *Atlanta, Georgia* 30334

The natural conditions in a single zone in each study area will be altered with placement of a marked artificial reef. Initially, reef construction and placement will be conducted, to coincide with current efforts by the Marine Institute, Sapelo Island, Georgia. Proposed materials include discarded tires and or concrete obstacles. Size and specific placement of reefs are to be determined. Designs will follow illustrations given by Edmund (1957).

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0062, MARINE TOXINS OF THE TROPICAL PACIFIC

A.H. BANNER, Univ. of Hawaii, Hawaii Inst. of Marine Biology, *Honolulu, Hawaii* 96822

1) To investigate the biological origin, chemistry and pharmacology of the toxins causing the disease, ciguatera, that originates from eating fish associated with coral reefs in the Indo-Pacific and Caribbean. All evidence points to an origin of the toxins in the primary trophic level and their transmission through the second trophic level fishes and possibly invertebrates to carnivorous fish. The toxins are evidently ingested and accumulated without harm to the fish. In chemistry, the purified toxin or its derivative has now been obtained as a crystalline product; its structure will be investigated. In pharmacology we have discovered that the primary action of the toxin is to disrupt the ionic balance of cellular membranes. This manifests itself in the symptoms as a neurotoxin. In addition to the principal toxin described above there is at least one other water soluble toxin of different chemistry, pharmacology and possibly biological origin found in some of the ciguatoxin fishes.

2) The project will also seek out other toxins of marine origin that may appear in human diets. This work will be done as time and funds are available. The project has been continuing for 15 years under various sources of funds; a request has been submitted to the Public Health Service for a three-year continuation.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - P.H.S.

1.0063, EVALUATION OF CATCH-AND-RELEASE REGULATIONS ON CUTTHROAT TROUT IN THE NORTH FORK OF THE CLEARWATER RIVER

J.F. KEATING, State Fish & Game Department, *Boise, Idaho*

The objectives in this, the first year of a five-year program, are to: 1. Measure the angling pressure and catch by species and size classes in both the control and test stream areas. anglers to determine their fishing habits and preferences for fish size and species and their reaction to proposals to change bag limits, seasons, or to restrict fishing gear or harvest. 3. Assess fish species and age structures of indigenous populations by snorkeling and electrofishing. 4. Assess fish movements by branding and underwater observations.

Procedures: 1. Kelly Fork and tributaries will be the test area - the North Fork of the Clearwater River about Kelly Fork will be the control area. 2. During the first year (1969) both areas will continue to have normal seasons and regulations; thereafter, Kelly Fork and tributaries will have a catch-and-release regulation for all trout. 3. In 1969, the project leader and an assistant will conduct an intensive creel census of both areas to measure angling pressure and catch by size and species and to discretely ask questions to ascertain angler preference and opinions as outlined in the OBJECTIVES. 4. They will establish underwater trend count stations and enumerate species composition and size structure in both the control and test areas. They will electrofish sections of smaller streams for the same reasons. 5. They will catch, brand, and release fish in the trend count stations to assess movements.

The 1969 data will provide the 'before' data for comparison with the next four years' data. During this time, steelhead year classes will be cut off by Dworshak Dam and the data collected will, in part, be applicable to both streams with and without steelhead.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0064, NATURAL, ARCHEOLOGICAL, AND HISTORICAL RESOURCES OF THE WABASH RIVER BASIN, INDIANA-ILLINOIS

R.E. CARLSON, Indiana University, Graduate School, *Bloomington, Indiana* 47401

Identification and evaluation of existing natural, historic, and archeological resources of the Wabash River Basin, and the need for special consideration such as preservation, additional studies, survey or possible salvage.

SUPPORTED BY U.S. Dept. of Interior - Natl. Park Serv.

1.0065, ENVIRONMENTAL EFFECTS OF RECREATIONAL USES OF MONROE RESERVOIR

R.E. CARLSON, Indiana University, Water Resources Research Ctr., *Bloomington, Indiana* 47401

A study of problems resulting from recreational use of Monroe Reservoir in Southern Indiana will attempt to determine how recreational activities affect the quality of the water and the land immediately surrounding the reservoir, and to discover means of developing greater public concern for the care and wise use of the environment.

SUPPORTED BY Indiana University - Bloomington

1.0066, PURR-WICK - PLASTIC UNDER POROUS ROOTZONES WITH WICK ACTION

W.H. DANIEL, Purdue University, School of Agriculture, *Lafayette - West Lafayette, Indiana* 47907

Porous rootzones under compacted turf and other contrived planting areas present need for fast infiltration, maximum water and nutrient conservation, and constant use.

Plastic sheeting developed as a layer over a series of subgrade tiers allows architect leeway in design of area.

PURR-WICK provides a rooting matrix which uses the large pores of compacted particles above an impermeable underlay (plastic sheeting). Drainage tubes - placed just above the barrier - have adjustable outlets, which can redistribute, conserve or remove water as needed.

Such a system permits fast infiltration and constant redistribution of water by capillary (wick) action to active roots (absorbing water), and to the rootzone surface (when evaporating water). It, thus, maintains uniform growing and playing conditions (for golf, athletics, etc.).

When excess rain occurs, rapid percolation favors fast removal through sand and drains to controlled exits. When conservation is desired and daily water use is high, reserves can be created by upward adjustments of terminals. Thus, the designer and contractor provide the turf manager maximum storage, plus control of both dry and wet fluctuations.

SUPPORTED BY Purdue University

1.0067, RESEARCH IN ROADSIDE DEVELOPMENT AND MAINTENANCE

F.O. LANPHEAR, Purdue University, Joint Highway Research Project, *Lafayette - West Lafayette, Indiana* 47907

This research is in three parts: Part I on Roadside Turf Development; Part II on the Selection, Establishment and Maintenance of Ornamental Plantings for Roadsides; and Part III on Chemical Weed Control. Part I includes selecting, testing, developing, and proving vigorous fast-growing bluegrasses especially adaptable for new construction and erosion areas. Part II is an evaluation of woody ornamental plants for their adaptability to conditions in Indiana, a determination of efficient methods of establishing highway plantings to insure their survival, an investigation of methods for reducing maintenance costs and insuring permanent beauty. Part III includes research on the use of chemicals for selective weed control and as a soil sterilant. Application techniques are also to be investigated.

SUPPORTED BY U.S. Dept. of Transportation - Public Rds.

1.0068, PLANNING AND DESIGN OF ROADS FOR REGIONAL DEVELOPMENT

H. OGAWA, Hokkaido University, *Hokkaido - Sapporo, Japan*

A standard of road planning from the point of view of regional development is being established. The study includes: A correlation between development index and road density index in a region, optimum density of roads in an area, basis of layout of roads in a region, establishment of an interstate highway system, general concepts to plan roads to develop mountain areas, planning standards of highway systems to develop industry, planning and design of touring roads, planning of road systems in farm districts, road planning in Hokkaido, and rational arrangement of traffic and transportation facilities in Hokkaido.

SUPPORTED BY Hokkaido University

1.0069, MAPPING AND EVALUATION OF VEGETATIVE COVER AND IMPORTANT FEATURES ALONG THE ROCKCASTLE AND UPPER GREEN RIVERS (ABBREV)

J.F. BRUNA, State Dept. of Fish & Wl. Rso., *Frankfort, Kentucky* 40601

Objectives: To determine the potential recreational carrying capacity of the streams and associated terrestrial habitats based upon an evaluation of their physical, fish and wildlife capabilities.

The evaluations of recreational potentials for such activities as picnicking, camping, swimming, canoeing, hiking and nature study, will be based primarily upon a physical inventory of the streams and adjacent habitats. This will take into account such factors as the availability and suitability of access, habitat types, topography, water flow, pollution, weather, geology, population density and adjacent land use. Many of these factors and physical features will be recorded on the cover and topographic maps. Standards and guides used in determining recreational potentials for the above mentioned activities will be partly obtained from the Bureau of Outdoor Recreation's publication 'Outdoor Recreation Space Standards' and the Soil Conservation Service's 'Guide to Making Appraisals of Potentials for Outdoor Recreation Developments.' Other literature will be reviewed for additional information on standards and criteria for these activities. A rating and evaluation form will be formulated for use during field surveys. (Text abridged)

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0070, RESERVOIR DISCHARGE INVESTIGATION

J.R. CHARLES, State Dept. of Fish & Wl. Rso., *Frankfort, Kentucky* 40601

Objectives: To determine the fish population structure in Barren River Reservoir and in Nolin River Reservoir.

Procedures: Fish population studies will be made once each month (May-September) in cove areas at both reservoirs. Each study area will be at least two acres in size, and the September studies will encompass five acres at each reservoir. Standard methods to be used, as developed by the Kentucky Department of Fish and Wildlife Resources fisheries staff, are the same as those described in Job II-C. Information expected to be gained from these studies was described by Bernard T. Carter in a paper presented at the 1957 Southern Division, American Fisheries Society meeting.

Estimation of the total abundance of certain pelagic species, particularly the shads, will be made by midwater trawl sampling once a year at both reservoirs. The Bureau of Sport Fisheries and Wildlife has agreed to provide the necessary personnel, equipment, and computer processing of data on an annual basis. Kentucky will provide any assistance and supplementary gear needed.

Relative abundance and spatial distribution of littoral and pelagic fishes will be determined during critical periods of summer stratification by sampling fish populations with suitable gill nets. Net samples of fish will be secured in such manner that resulting data will indicate the sections of the reservoir actually utilized by the species sampled under the proposed experimental water discharge regimes. A minimum of six gill-net samples (three at each reservoir), each sample consisting of the combined catch from two consecutive overnight sets of 1', 1 1/2', 2', and 2 1/2' mesh (bar measurement) sinking gill nets, will be obtained each year during the months of August and September (when stratification becomes most pronounced). Nets will be set so as to be stretched perpendicularly from the shoreline and each mesh size will be fished in corresponding depths and general locations. Sampling stations will be selected and fished in such manner that the nets will effectively sample representative reservoir depths encompassing the epilimnion, metalimnion and hypolimnion in the upper, middle and lower sections of both reservoirs. Recording of data concerning fish samples will be such as to permit reliable analysis of the depth distribution of the various species within the reservoir at the time of sampling.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0071, RESERVOIR DISCHARGE INVESTIGATION

J.R. CHARLES, State Dept. of Fish & Wl. Rso., *Frankfort, Kentucky* 40601

Objectives: To determine the effect of hypolimnetic versus epilimnetic discharge on the relative abundance of macrobenthos in the regions of the epilimnion, metalimnion, and tailwaters of Nolin and Barren River Reservoirs.

Procedures; In each reservoir, six sampling stations, two in each of three major areas (upper, middle and lower reservoir areas), will be established. At each sampling station one pair of sampling devices will be emplaced and anchored within each of three strata - the epilimnion, metalimnion and hypolimnion. An additional pair of sampling devices will be emplaced in the tailwaters of each reservoir. Thus, the total number of samplers employed in each reservoir and tailwater will be 38. Samplers consist of meshed wire baskets, 1' x 1' x 6', filled with graded stone (Mason et al. 1967. Prog. Fish. Cult., April; 74). Samplers will be left in their respective places for two-month periods, to allow adequate colonization to occur, beginning in April and ending in August. At the end of each two-month period all samplers will be retrieved, benthos removed, and except in October, reemplaced. Benthos samples will be preserved, processed and analyzed in an appropriate manner.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0072, RESERVOIR DISCHARGE INVESTIGATION

J.R. CHARLES, State Dept. of Fish & Wl. Rso., *Frankfort, Kentucky* 40601

Objectives: To determine the water quality characteristics of Barren River Reservoir and tailwater, and of Nolin River Reservoir and tailwater.

Procedures: Temperature, dissolved oxygen, pH, and specific conductance values will be monitored monthly (biweekly in May, July, August and September) at a minimum of six widely-separated sampling stations in each reservoir and at a single station in each tailwater. Determinations will be made from surface to bottom at five-foot intervals. The U. S. Army Corps of Engineers Louisville District, using automatic sampling equipment, will conduct this phase of the project. They will make the resulting data available to the Kentucky Department of Fish and Wildlife Resources.

Supplementary water quality sampling will be done in both reservoirs and their tailwaters by project personnel. Sampling will be done each month on the same schedule utilized by the Corps of Engineers but at different stations and, in addition to the parameters stated above, will include determinations of total alkalinity and free carbon dioxide values.

Semiannual (summer pool and winter pool) water samples will be collected from both reservoirs and major inflowing streams and submitted to the Federal Water Pollution Administration laboratory in Evansville, Indiana.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0073, RESERVOIR DISCHARGE INVESTIGATION

J.R. CHARLES, State Dept. of Fish & Wl. Rso., *Frankfort, Kentucky* 40601

Objectives; To determine the following sport fishery statistics at Barren River Reservoir and tailwater, and at Nolin River Reservoir and tailwater; (1) sport fishing quality; (2) fishing pressure; (3) yield (harvest); (4) catch composition; and (5) miscellaneous fishery characteristics.

Procedures: Non-uniform (unequal) probability creel surveys will be conducted on both reservoirs and their tailwaters from March 1 through October 31. Survey design will follow recommendations of Dr. Don W. Hayne of the Southeastern Cooperative Fish and Game Statistics Project. Departmental conservation officers all of whom have had prior creel survey experience, will serve as creel clerks. Survey results will be published in accordance with recommendations of the Southeastern Division's (American Fisheries Society) Reservoir Committee.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0074, MEASURING THE INTANGIBLE VALUES OF NATURAL STREAMS

J.A. DEARINGER, Univ. of Kentucky, School of Engineering, *Lexington, Kentucky* 40506

The proposed research is an attempt to measure quantitatively those intangible values peculiar to natural streams and their surroundings (scenic beauty, esthetic appeal, etc.) The work will be limited to free flowing streams of sixth order or less selected from those Kentucky creeks and rivers known to have scenic or wilderness qualities. At least one stream each in six of Kentucky's eight physiographic regions will be studied.

The research plan: (1) Selection of streams to be used in the study. (2) Collection of photographs depicting esthetic values, disvalues and other significant intangibles typical of areas along each study stream. (3) Evaluation of the study streams for those key elements usually considered as intangibles by applying a modified version of the methodology developed in OWRR project A-010-KY. (4) Design and conductance of a survey to determine the preferences of a sample of the public for the intangibles as perceived in photographs selected from (2) above. (5) Analysis of the results of the preference survey to isolate the factors that best represent public preferences. (6) Correlation of the physical measures of (3) with the psychological measures of (4) & (5). (7) Development and testing of the evaluation procedures derived from (6).

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0075, A RECONNAISSANCE STUDY OF THE CHESAPEAKE BAY

P.R. FARRAGUT, Regional Planning Council, *Baltimore, Maryland* 21202

The report discusses present and future problems confronting the region's shoreline. It synthesizes many of the narrowly focused technical studies completed in the past and presents them in a form which should be of interest to decision makers.

The study recognizes the many important relationships that exist along the bay shoreline at the interface of the land and water resource. The focus in this report is the water resource while a future publication will examine the land resource.

The report discusses physical problems associated with the regional shoreline such as erosion, sedimentation, tidal flooding and water characteristics such as excessive nutrients, polluted shellfish areas, thermal pollution, plant and animal nuisances, the importance of wetlands, and the Susquehanna River.

A separate chapter on water quality contrasts present conditions with the standards called for by the State's Water Quality Standards.

Finally, a functional listing of agency responsibilities and studies that may be of interest is listed under the various problem areas discussed in the text as well as certain economic indicators of the bay fishery, hunting activities, and the sport fishery.

SUPPORTED BY U.S. Dept. of Housing & Urban Development

1.0076, A PHYSICAL, CHEMICAL AND PHARMACOLOGICAL STUDY OF THE TOXIN OF THE SEA NETTLE, CHRYSAORA QUINQUECIRRHA

J.W. BURNETT, Univ. of Maryland, School of Medicine, *Baltimore, Maryland* 21201

Detailed physical, chemical and pharmacological analyses of purified toxin will be made in the laboratory from the manubriae and tentacular tissue in both the fresh and autolyzed material supplied by the Chesapeake Biological Laboratory. These findings will be accompanied by a study of the mechanism of nematocyst discharge. Both efforts are designed to form a rational basis for developing methods to inhibit the effects of the toxin in the sea nettle sting. Bioassay procedures utilizing LD sub 50 for mice will be correlated with the reaction in other dermatological tests to provide a more reliable method of determining the relative toxicity of the nematocyst. The work will be performed by Joseph W. Burnett, with David G. Cargo and Rosalie M. Vogel, and other temporary laboratory assistance as necessary. This study will continue throughout F.Y. 1970.

The physical resources and staff of the University of Maryland may be drawn upon for assistance when necessary.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

1.0077, A STUDY OF POSSIBLE CHEMICAL CONTROL AGENTS AND AN EVALUATION OF IMPROVED PHYSICAL BARRIER SCREENS

D.G. CARGO, Univ. of Maryland, Natural Resources Institute, *Solomons, Maryland* 20688

Any program designed to regulate the numbers of aquatic organisms must consider chemical control agents and barrier screens. To this end, the response of the polyp stage to certain chemicals will be examined in the laboratory. Short term exposure to low concentrations will be made and the condition of individuals one week later will be the criterion for success. Chemicals already tested against other organisms will be screened first, utilizing published information of their virulence. Promising agents will, in subsequent phases, be tested for effects on other aquatic organisms. The physical barrier study will entail a survey of existing structures, interviews, and then attempting to develop a set of criteria for an efficient structure, recognizing the local geographic and hydrographic conditions. Consideration of wave action, exposure, water currents will be related. Preliminary tank and laboratory testing of utilizing bubble screens alone and in conjunction with fencing structures will be made. The Mechanical Engineering Department of the University of Maryland will be consulted on many aspects of this study, which is expected to require the entire calendar year. David G. Cargo and Leonard P. Schultz will be involved in this study. Miss Rosalie Vogel and David G. Cargo will be responsible for the chemical screening tests.

The physical resources and staff of the University of Maryland may be drawn upon for assistance when necessary.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

1.0078, STUDIES OF THE LIFE HISTORY OF THE SEA NETTLE, CHRYSAORA QUINQUECIRRHA, IN CHESAPEAKE BAY WATERS

D.G. CARGO, Univ. of Maryland, Natural Resources Institute, *Solomons, Maryland* 20688

This phase is a continuation of the study of the life cycle of the sea nettle. We are investigating the response of the polyp stage to simultaneous changes in salinity and temperature, the respiratory activities and the reproductive phenomena of the medusa. The protein analysis of the polyps will be continued by Mrs. Marcia Loeb of the Department of Zoology of the University of Maryland.

Monitoring through regular sampling in the field and laboratory experiments and controlled cultural techniques will be employed to elaborate these various details. Identifications of other related jellyfish will be made and then used for the development of cultural techniques and for comparison with the sea nettle.

All of these studies will be performed at Solomons, Maryland or in the Chesapeake Bay by David G. Cargo, Rosalie M. Vogel, and Michael J. Reber.

The physical resources and staff of the University of Maryland may be drawn upon for assistance when necessary.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

1.0079, STUDIES OF THE LIFE CYCLE AND ECOLOGY OF ORGANISMS WHICH MAY BE USED TO CONTROL THE NUMBERS OF SEA NETTLES

D.G. CARGO, Univ. of Maryland, Natural Resources Institute, *Solomons, Maryland* 20688

Certain gastropod molluscs in the order Nudibranchia have been observed feeding on scyphozoan scyphistomae. Since some are known to prefer coelenterate foods, knowledge of their life cycle or habits is essential. Their tolerances, modes and season of reproduction, and the development of cultural techniques of species in the genera 'Cratena' and 'Embletonia' are of particular interest and varied studies on them both in the laboratory and the field will be emphasized. Since the seasonality of their life cycle is not known, this is a long range project that will take a few years to complete. David G. Cargo, Leonard P. Schultz, Rosalie M. Vogel and Michael J. Reber will be involved in this project. The work will be based at CBL, Solomons, Maryland.

We will attempt to establish the validity of the taxonomic status of 'Cratena.'

The physical resources and staff of the University of Maryland may be drawn upon for assistance when necessary.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

1.0080, ASSESSMENT OF CHEMICAL POLLUTANTS IN UNDERWATER EXHAUST OF WATERCRAFT ENGINEERING

L.N. KUZMINSKI, Univ. of Massachusetts, School of Engineering, *Amherst, Massachusetts* 01002

There is need for the establishment of public policy to guide the growth of recreational boating and to protect all legitimate uses of the water resource. The overall objective of this project is to develop criteria to be used in establishing public policy on restriction of watercraft use in inland waters.

The research proposed herein will address itself initially to the problem of chemical substances in watercraft exhaust discharged under water. A first step is to determine the amount of such pollution disseminated as a function of watercraft horsepower and use. Subsequent laboratory work calls for the evaluation of removal efficiency by water treatment processes and toxicity testing. Field studies will be then carried out to correlate stress exerted on the water with pollutant build-up.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0081, CONSERVATION SERVICES CENTER

A.H. MORGAN, Mass. Audubon Society, *Boston, Massachusetts*

The Center, organized in 1966 with a grant from the Foundation, provides public information, membership solicitation and information research services to citizens' groups interested in environmental quality. The Center fundamentally is a talent pool of writers and artists experienced in public communication. By sharing costs, it enables organizations to utilize an expensive staff and other resources which individual groups could not afford at normal commercial rates. The Center produces anything from news stories to elaborate brochures designed to interest, educate and enlist public support of conservation. To insure accuracy, the Center maintains extensive files on all environmental problems, has access to the services of three fulltime professional scientists, and can call upon the Boston-Cambridge research complex for information and aid. The Center publishes co-operatively a quarterly magazine and issues 10 newsletters annually for clients personalized to each separate organization in five New England states. It produces audio-visual programs and has explored new techniques in presenting lectures. It has served many organizations outside of New England and always is willing to aid others.

SUPPORTED BY Ford Foundation - New York, N.Y.

1.0082, WATER RESOURCES POTENTIAL OF AN URBAN ESTUARY

J.J. COCHRANE, Northeastern University, School of Engineering, *Boston, Massachusetts* 02115

An investigation of the physical, chemical and biological parameters pertinent to the development of an urban estuary for recreation and flood control. Specific objectives are: Effects of nitrogen and phosphorous on the development of estuarine algae. Influence of bottom deposits, including nutrients and toxic materials, on the balance of the ecosystem. Determination of background levels of physical, chemical and biological data to ascertain the impact on the estuary of the proposed construction of a flood control detention basin. Development of improved methodology for characterization of an estuarine environment including data collection frequency and computer graphics.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0083, INTRODUCTION OF KOKANEE SALMON IN ONOTA LAKE

J. BERGIN, State Div. of Fisheries & Game, *Boston, Massachusetts* 02202

Objectives: To establish kokanee salmon in Onota Lake, Pittsfield, for purposes of providing additional angling opportunity for coldwater species.

Procedures: Onota Lake, Pittsfield, is a 627-acre lake with maximum depth of 64 feet and average depth of 22 feet. Twenty-five percent, or 3,273 acre feet, of the Lake volume constitutes trout water. Total alkalinity and hardness within the thermodine average 75.0 and 85.0 ppm, while Mg and Ca average 8.0 and 17.0 ppm respectively. Since morphometry and chemical constituent characteristics of the Onota Lake are similar to East Twin Lake in Connecticut where a successful kokanee fishery has been established, logic dictates that an attempt at introduction of this species be made at Lake Onota.

Kokanee salmon eggs will be obtained from an appropriate source (Connecticut) and reared in the Palmer Fish Hatchery to fingerling size and stocked in Lake Onota. In an effort to establish a kokanee population, 250,000 fingerlings will be planted for a four-year period. The goal will be for the population at maturity to supply eggs to sustain the fishery and expand some to other, yet to be determined, suitable waters. Fish population sampling employing gill nets will be conducted during summer months to check on success of introductions. Once the fishery is established, creel census, Work Plan II, will be employed in determining utilization by anglers.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0084, CREEL CENSUS AT LITTLEVILLE RESERVOIR

J. BERGIN, State Div. of Fisheries & Game, *Boston, Massachusetts* 02202

Objectives: To determine the quality of fishing expressed as total harvest at Littleville Reservoir, a managed trout pond, for purposes of documenting a significant fishery on which recreational fishing was threatened due to closure for water supply reasons.

Procedures: Littleville Reservoir is accessible to boat and shore fishermen at two access areas, one near the dam and the other at the north end of the reservoir. A stratified random census involving one weekend day and one weekday per week will be conducted. The census will alternate between the two areas open to fishing with the creel census agent checking as many completed anglers as possible. Angler counts on the 175-acre reservoir will be made by the agent with a boat at predetermined times.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0085, COASTAL AND INLAND WETLANDS SURVEY

W.W. BLANDIN, State Div. of Fisheries & Game, *Boston, Massachusetts* 02202

Objectives: To establish a priority listing of high-quality coastal and inland wetlands suitable for acquisition, and conduct on- site investigations of wetland areas proposed for acquisition to determine in detail the ecological characteristics of such areas with respect to probable value as waterfowl habitat.

Procedures: Initial priority lists of wetland areas will be based on (1) recommendations of District and Game Managers in each district, and (2) a review of previous Massachusetts wetlands studies, especially the recent coastal and inland wetland studies prepared by the Department of Natural Resources.

Field investigations of each area will include a study of: 1. Location 2. Size 3. Habitat type 4. Water quality, volume, depth, and water resource values 5. Soil type and fertility 6. Physiography 7. Management possibilities 8. Recreational and aesthetic values 9. Relation to other selected areas. A report on areas to be acquired will be submitted to the Realty Section for action leading to eventual purchase.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0086, RECREATIONAL TRIP MODEL FOR CAMPERS IN MICHIGAN STATE PARKS

E.Y. HUANG, Michigan Technological Univ., School of Engineering, *Houghton, Michigan* 49931

A recreational trip model will be developed to describe the functional relationship of trip generation, attraction, and spatial resistance in reference to use of Michigan State parks camping facilities. A spatial interaction model will be developed and calibrated, with pertinent statistics for selected Michigan counties and state parks.

SUPPORTED BY Michigan Technological University

1.0087, HYDROLOGY OF RIVER-BASED RECREATION

G.E. HENDRICKSON, U.S. Dept. of Interior, Geological Survey, *Lansing, Michigan* 48933

Purpose - This research is part of the program of water resources investigations conducted by the U.S. Geol. Survey in cooperation with the State of Michigan. To analyze the hydrologic factors related to use of cold-water rivers in a glacial terrain, to provide guidelines for assessing the potential recreational value of such rivers, and to determine how development by man in the watersheds affects the recreational value of the streams.

Methods - On the basis of streamflow and water quality records, geology, topography, and amount of development, select representative rivers in northern Michigan, assemble information regarding streamflow characteristics, stream morphology, water temperature, ground-water levels, and areas of ground-water discharge. Obtain information on recreational potential of rivers, including fish populations and present and future use for fishing, boating, and camping. Interpret relationships of recreational uses to hydrology of the watershed. In developed watersheds obtain information on surface and ground water withdrawals, disposal of sewage and other wastes, regulation by dams, and indirect controls by timber-cutting and other changes in land use in the watersheds. Report on relationships of characteristics of streamflow, water quality, and stream morphology to river-based recreation.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

1.0088, LAKE OF THE WOODS CENSUS AND SURVEY

C. BURROWS, State Div. of Game & Fish, *Saint Paul, Minnesota* 55101

Objectives: Lake of the Woods supports both sport and commercial fisheries for game fish species such as walleyes, northern pike and saugers. The commercial fishery is one of long standing, having operated continuously since the turn of the century. It is closely controlled and regulated to keep the catch of game fish below the level at which it will become competitive with the sport fishery.

The sport fishery has increased steadily since the late 1940's, and improvements in boats, outboard motors, and fishing facilities in the area have accelerated development in recent years. There is considerable unrest and deep concern among local sport fishing interests that commercial fishing for walleyes is seriously affecting the quality of sport fishing.

The commercial catch of walleyes has remained constant through the years at about one pound per acre per year, and walleye lakes of this region have a sustained yield capability of about three pounds per acre per year. No quantitative estimate of the sport fishing catch has been made, however, to determine whether the threat of competition for this species exists.

Occasional spot checks of walleye population structure and angling success have not indicated the presence of over-fishing. There is a need for a detailed examination of the fish population and census of the fishery at this time. Therefore, project objectives are as follows: 1. To obtain a reliable, quantitative estimate of the sport fishing catch from Lake of the Woods with special emphasis on the walleyes. 2. To determine the species composition, size and age structure, growth rate and relative abundance of the fish populations. 3. To determine the degree at which competition exists between the sport and commercial fisheries in the exploitation of the walleye stock.

Procedures: Job 1. Sport fishing catch will be determined with creel census commencing January and continuing through December. Census design will resemble a stratified random sampling of the fishing trips which will be stratified by area and time. Most of the winter and all of the summer census will be of completed trips. Sampling error will amount to between 12 and 15 percent. Job 2. Fish population sampling will be done throughout the summer months with standard experimental gill nets and a 25 foot trawl with 1/4-inch mesh in the bag. (Text Abridged).

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0089, EFFECT OF HEATED DISCHARGE WATER FROM POWER GENERATING PLANT ON FISH POPULATIONS & FISHING IN LAKE ST. CROIX (ABBREV)

H. KROSCH, State Div. of Game & Fish, *Saint Paul, Minnesota* 55101

Objectives: To collect, compile and evaluate information about fish populations and fishing success in the vicinity of the Allen S. King power generating plant at Oak Park Heights for two years prior to and three years after the plant goes into operation to determine the effects of heated discharge water on fish and fishing in Lake St. Croix. This information will be used to help formulate regulations governing operations of other power plants.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0090, A STUDY OF THE RECENT VEGETATIVE HISTORY OF THE BOUNDARY WATERS CANOE AREA

M.L. HEINSELMAN, U.S. Dept. of Agriculture, North Cen. Forest Expt. Sta., *Saint Paul, Minnesota* 55101

This study provides for a vegetation history for the BWCA for the period since white entry (ca. 1700 A.D.) which will answer two questions: (1) How did the present forest communities originate? (2) What differences, if any, are there between the present natural vegetation and the primeval, and between the disturbed vegetation and the primeval?

SUPPORTED BY U.S. Dept. of Agriculture

1.0091, A STUDY OF THE UPLAND NATURAL VEGETATION OF THE BOUNDARY WATERS CANOE AREA

L.F. OHMANN, U.S. Dept. of Agriculture, North Cen. Forest Expt. Sta., *Saint Paul, Minnesota* 55101

The primary objective is to characterize quantitatively the plant communities and their associated environments present within the study area. Utilizing these basic data, the relationships between communities and between communities and the environment will be investigated. Using the same data, the relationships between individual species and between species and the environment may be determined.

SUPPORTED BY U.S. Dept. of Agriculture

1.0092, THE UPLAND PLANT COMMUNITIES OF TWO ADJACENT RECENT WILDFIRE AREAS IN THE BOUNDARY WATERS CANOE AREA

L.F. OHMANN, U.S. Dept. of Agriculture, North Cen. Forest Expt. Sta., *Saint Paul, Minnesota* 55101

To compare the upland plant communities resulting from two 1936 wildfires which burned under similar fire conditions, during the same fire season, covering the same amount of acreage in essentially the same timber types, and which occurred adjacent to each other geographically.

SUPPORTED BY U.S. Dept. of Agriculture

1.0093, THE UPLAND DISTURBED VEGETATION OF THE BOUNDARY WATERS CANOE AREA

L.F. OHMANN, U.S. Dept. of Agriculture, North Cen. Forest Expt. Sta., *Saint Paul, Minnesota* 55101

The basic objective is to characterize quantitatively the disturbed plant communities and their associated environments. Comparisons will be made with the natural plant communities of a previous study in the Boundary Waters Canoe Area.

SUPPORTED BY U.S. Dept. of Agriculture

1.0094, SOIL SURVEY

H.F. ARNEMAN, Univ. of Minnesota, Agricultural Experiment Sta., *Saint Paul, Minnesota* 55101 (MIN-25-015)

OBJECTIVE: Inventory, classify, and make multiple use recommendations of the soils of the state.

APPROACH: Includes making soil maps, characterizing soils in the laboratory as to their physical, chemical, and mineralogical properties, correlation of soils within and between states, and publishing soil survey reports which describe the soils and give their use and management for a variety of purposes.

PROGRESS: A generalized soil landscape and geomorphic regions map was prepared of the Brainerd quadrangle area (U.S.G.S. notation) of the state. Descriptions and tables of selected physical and chemical characteristics were included for each geomorphic region. Field reviews on the progress of soil surveys in Anoka, Blue Earth, Chippewa, Freeborn, Kittson, Meeker, and Pipestone counties were made. The detailed surveys (1:15,840) of Douglas and Nobles counties were completed and final field reviews made. In cooperation with North and South Dakota, a generalized soils map of the Red River Valley and an accompanying monograph of soil description is being prepared. The survey of the Kawishiwi-Knife Lake Watershed of the Superior National Forest has been completed. The survey is being interpreted for forestry and recreational land use management.

SUPPORTED BY Minnesota State Government

1.0095, ECOMANAGEMENT OF FOREST VEGETATION ON PARKS AND RECREATIONAL AREAS

H.L. HANSEN, Univ. of Minnesota, School of Forestry, *Saint Paul, Minnesota* 55455 (MIN-19-077)

We have completed a reconstruction of the fire history of Itasca State Park going back to the 17th century. We have also completed studies of the regeneration of the various upland forest types and the current dynamics of the succession of these types. We have completed a study of the patterns of visitor use of the park. Tests of manipulating the forest in various (11) ways have been initiated focusing on the problems of regenerating red pine. A study is being initiated involving the use of Itasca State Park research data as a model for an ecomanagement systems study.

SUPPORTED BY U.S. Dept. of Agriculture

1.0096, ECOMANAGEMENT OF FOREST VEGETATION ON PARKS AND RECREATIONAL AREAS

H.L. HANSEN, Univ. of Minnesota, School of Forestry, *Saint Paul, Minnesota* 55455

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SUPPORTED BY U.S. Dept. of Agriculture

1.0097, INVESTIGATION OF THE FORM AND RATE OF DETERIORIATION OF NEWLY ESTABLISHED CAMPSITES

L.C. MERRIAM, Univ. of Minnesota, School of Forestry, *Saint Paul, Minnesota* 55455

This study is being conducted in the Boundary Waters Canoe Area, Superior National Forest, Minnesota. It seeks to determine if, how and why wilderness campsites on locations of differing vegetation types, use intensities, geological areas, soil types, slopes, and aspects deteriorate over a period of 5 years. Also sought is information on which deteriorate most quickly. The study will produce information useful to Superior National Forest administration in wilderness campsite management.

Progress: The study now in its third year covers 33 campsites created in 1967. Information has been collected at the beginning and end of each summer season on vegetation, soil and areal changes. Photographic coverage from permanent points is taken each time and use areas mapped in detail. Users are asked to register at onsite stations as to party size, means of travel, length of stay, tents placed on-site and preference for site.

SUPPORTED BY U.S. Dept. of Agriculture

1.0098, THE IMPORTANCE OF WATER RELATED ACTIVITIES AT STATE PARKS IN MISSISSIPPI

D.C. WILLIAMS, Univ. of Southern Mississippi, Graduate School, *Hattiesburg, Mississippi* 39401

Mississippi State Parks are centered around water resources. Water is probably the major drawing attraction. Indications are that the facilities are fully utilized and over utilized in several cases.

For proper water use management, facility planning, and funding, information is needed as to the relative importance of different activities and different water related activities in the various parks. Determination of these factors is the basic objective of this study.

The data will be obtained in collaboration with the Mississippi State Park Commission. The procedures used will be compatible with the recommendations to state parks by the Bureau of Outdoor Recreation.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0099, AN ECOLOGICAL AND RECREATIONAL USE SURVEY OF A SMALL MISSISSIPPI RIVER JUST BEFORE CHANNELIZATION

D.H. ARNER, Mississippi St. University, Graduate School, *State College, Mississippi* 39762

An ecological and recreational use study of a small Mississippi river just before channelization. Littoral Benthos macrofauna and fish populations will be sampled. Water and soil chemistry data will be collected. Water table levels will be measured along lines perpendicular to the river. Data concerning hunting and fishing use of the river will be collected. It is anticipated that a follow-up study will be made after channelization.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0100, EFFECTS OF PRESCRIBED BURNING ON UTILITY LINE RIGHTS ON WILDLIFE FOOD PLANTS AND OBJECTIONABLE WOODY PLANTS

D.H. ARNER, Mississippi St. University, Graduate School, *State College, Mississippi* 39762

Cost comparisons are made with other techniques in current use.

SUPPORTED BY Mississippi State University

1.0101, A STUDY OF THE WATER QUALITY AND PLANKTON DYNAMICS OF LAKE JACOMO, THE PRIMARY RECREATIONAL WATER FOR GREATER KANSAS CITY

D.H. STERN, Univ. of Missouri, Graduate School, *Columbia, Missouri* 65202

The proposed one-year study has as its goals the quantitation, analysis, and interpretation of the interrelationships between physical, chemical, and biological parameters in Lake Jacomo, a 970-acre recreational reservoir serving yearly over 1,000,000 residents of the Kansas City metropolitan area. Physicochemical factors to be examined include water temperature, dissolved oxygen, light transmission, pH, specific conductance, turbidity, ammonia-, nitrite-, and nitrate- nitrogen, phosphate, silica, total and phenolphthalein alkalinities, and total and calcium hardness.

Biological factors examined will include the identification and quantitation of the plankton (determination of standing crop) and productivity studies (light & dark bottle). While gaining the requisite information, we shall consider the following points: (1) the effects of eutrophication of lake water by runoff from surrounding farmlands and feed lots: (2) the quality of the water with respect to primary and secondary recreation and aesthetics; (3) the acquisition of baseline information for comparison of changes in water quality at other seasons and during succeeding years; (4) the presence of sources of pollution in the lake waters; and (5) recommendations for the management of Lake Jacomo and other reservoir lakes soon to be constructed.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0102, FISH FOR FUN REGULATION ON COURTOIS CREEK

O.F. FAJEN, State Dept. of Conserv., *Jefferson City, Missouri* 65102

Objectives: To evaluate the effect of a 'fish for fun' regulation for smallmouth bass on the fishery of a heavily-used smallmouth stream.

Procedures: Starting with the 1969 season, smallmouth bass in the study section of Courtois Creek may be caught but none may be kept. The effects of this regulation will be evaluated by the following studies: 1. The standing crop of fish in Courtois Creek (Job No. 1) 2. Spawning and survival of smallmouth bass and associated species in Courtois Creek (Job No. 2) 3. Harvest of fish from Huzzah and Courtois Creeks (Job No. 3).

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0103, THE ECOLOGY OF SMALLMOUTH BASS STREAMS

O.F. FAJEN, State Dept. of Conserv., *Jefferson City, Missouri* 65102

Objectives: To investigate the ecology of a smallmouth bass stream and determine factors which limit fish production.

Procedures: Field work on this project was completed in calendar year 1968. It is continued for the purpose of preparation of a comprehensive report including the following aspects: 1. The standing crop of fish in Courtois Creek (Job No. 1), 2. Spawning and survival of smallmouth bass and associated species in Courtois Creek (Job No. 2), 3. A quantitative creel census of Huzzah and Courtois Creeks (Job No. 3).

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0104, TAILWATER FISHERIES

W.D. HANSON, State Dept. of Conserv., *Jefferson City, Missouri* 65102

Objectives: To evaluate tailwater fisheries, determine their parameters and the factors which contribute to and limit them.

Procedures: Investigate the following aspects of tailwater fisheries: Harvest of fish in tailwaters (Job No. 1).

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0105, IMPOUNDMENT MANAGEMENT METHODS

W.D. HANSON, State Dept. of Conserv., *Jefferson City, Missouri* 65102

Objectives: To investigate methods for improving the management of reservoirs.

Procedures: The following reservoir management methods will be investigated: 1. Acclimatization and utilization of threadfin shad (Job No. 2).

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0106, ACCLIMATIZATION AND UTILIZATION OF THE THREADFIN SHAD

W.D. HANSON, State Dept. of Conserv., *Jefferson City, Missouri* 65102

Objectives: To determine the degree to which threadfin shad can be acclimated to Missouri waters and to study their usefulness as forage fish in reservoirs.

Procedures: A stock of threadfin shad will be obtained from Montrose Reservoir and released in the lake at Blind Pony Wildlife Area. Samplings will be made to see whether they survive and spawn and to what extent they may be used as forage.

In addition, attempts will be made to collect eggs on spawning mats from threadfin shad as they spawn along the shoreline of Montrose Reservoir. These eggs will be moved to ponds on the Big Buffalo Creek Wildlife Area and to a pond on the Little Dixie Wildlife Area to see whether they hatch and whether the young survive.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0107, MICROBIOLOGICAL STUDIES IN AN OPEN AND A CLOSED WATERSHED

W.G. WALTER, Montana State University, School of Letters, *Bozeman, Montana* 59715

Microbiological and chemical studies have been made during recent summers and last winter on waters serving Bozeman. One of the watersheds has been closed to the public for about 47 years except for limited logging; the other has been open for extensive logging and recreational use. Quantitative and qualitative bacteriological tests have often resulted in higher 'total', enterococcic and coliform counts in the closed area possibly because of closer proximity to streams of animals present.

Studies directed to identifying microbes in deer, elk, moose, etc. droppings and to determine the presence of these bacteria in the waters at different locations, particularly in the closed watershed, have revealed the same types of organisms occurring in both the animal droppings and the streams.

The closed watershed was opened to limited public access this spring.

Interim reports are available from principal investigator.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0108, NORTHERN YELLOWSTONE ELK MIGRATION

J.J. CRAIGHEAD, Univ. of Montana, State Coop. Wildlife Res. Unit, *Missoula, Montana* 59801

The elk herds in Yellowstone National Park constitute a most important element in the management of vegetation and other animal life. The present study is an attempt to identify the migration routes, times of migration, and summer range of herd segments in an effort to learn the influence of overuse by elk of summer range on such sensitive species as bighorn sheep and to ascertain when and where reduction of the herd can be accomplished most effectively to meet needs thus revealed.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0109, SOME ECOLOGICAL RELATIONSHIPS OF GRIZZLY AND BLACK BEARS OF GLACIER NATIONAL PARK

S.S. FRISSELL, Univ. of Montana, School of Forestry, *Missoula, Montana* 59801

Ecological relationships of grizzly bears and black bears will be studied in the Apgar Mountains of Glacier National Park. Emphasis will be placed on intra- and interspecific relationships, seasonal food habits, and the impact of a recent burn on bear habitat.

SUPPORTED BY U.S. Dept. of Agriculture

1.0110, THE BIOTIC COMMUNITIES OF THE DANAHER VALLEY, BOB MARSHALL WILDERNESS AREA, MONTANA

S.S. FRISSELL, Univ. of Montana, Graduate School, *Missoula, Montana* 59801

One management goal for national forest wilderness areas is to 'promote, perpetuate, and, where necessary, restore the wilderness character of the land.' In most wilderness areas we have inadequate background information on the precise nature of either the contemporary or pre-whiteman 'wilderness character' we seek to preserve and/or maintain. This study is designed to provide some of this background information for a portion of the Bob Marshall Wilderness Area. The study objectives are:

1. To determine what natural biotic communities existed in the study area before the influence of modern man. This will involve examination of historical journals, records, surveys, and reports to obtain all possible first-hand data on the original communities. Additional information will be gained through the identification and study of relics of these communities.

2. To evaluate the role of wildfire in the maintenance of these early biotic communities. Information from historical documents and an intensive study of fire scar dates and forest age class structure will be used to obtain a picture of the nature, frequency, and area affected by wildfire.

This project began in July 1968 and will continue until June 1971.

SUPPORTED BY U.S. Dept. of Agriculture

1.0111, RECREATION POTENTIAL OF THE TRUCKEE RIVER BASIN FROM LAKE TAHOE TO PYRAMID LAKE

C.S. SALADINO, Univ. of Nevada, Agricultural Experiment Sta., *Reno, Nevada* 89507 (NEV00673)

To determine the amount of available recreational space. To develop a visual survey, legal ownership, design alternatives, a general recreational master plan, evaluate existing conditions and characteristics and implementation of proposals derived through the synthesis process. Under existing and new serial photos and reconnaissance both by foot and air evaluation of physical characteristics of basin. An eye level visual survey by water and land using sketches and photos to describe the landscape in relation to motion through it. Evaluation of existing data and preliminary designs. Development of a comprehensive recreational master plan through intensive physical design efforts to include mapping legal ownership, design alternatives for specific sites, esthetic considerations and a practical implementation program phased on a yearly basis.

SUPPORTED BY U.S. Dept. of Agriculture

1.0112, METHODS FOR MAKING WILDLIFE A PRODUCTIVE AND MARKETABLE CROP FOR NEVADA FARMS.

J.E. WOOD, Univ. of Nevada, Agricultural Experiment Sta., *Reno, Nevada* 89507

Develop management methods for wildlife and compatible crops. Test new species of plants for wildlife and soil conservation and develop criteria for raising and supplemental stocking of gallinaceous birds for fee hunting on small farm unit.

Test plant combinations in various sizes as field borders, vary the irrigation and cultivation practices in the field borders and check the game bird nesting and brood use of the borders. Test species and varieties of plants for adaptability to arid, irrigation and flood plain conditions and use as wildlife food and cover. Check compatibility of game birds and farm crops and cultivation methods and develop methods of raising and stocking gallinaceous birds for maximum hunting and economic returns.

SUPPORTED BY U.S. Dept. of Agriculture

1.0113, NEW HAMPSHIRE-TOMORROW - A COOPERATIVE EFFORT TO INITIATE ENVIRONMENTAL DEMONSTRATION PROJECTS & CREATE AWARENESS OF PROBLEM

R.D. SHEAFF, New Hampshire Charitable Fund, *Concord, New Hampshire*

Five Action Teams, each consisting of representatives of business, labor, civic groups, State agencies and local governments, have been established: Economic Growth and the Environment, Pollution Control, Scenery Preservation, Acquisition and Access, Environmental Education. Over 40 specific projects are being carried out under these categories, including: establishment of a local community recreational park, introduction of environmental topics into elementary and college curricula; study of sedimentation problems accompanying land sub- division; establishment of a multi-community open pit incinerator for solid waste disposal; testing of dye kits to identify water pollution; control of eutrophication through stratification; spray irrigation; design of industrial parks; junk car removal; visual inventory of New Hampshire's seacoast; scenic rehabilitation and preservation of a highway; establishment of the legal ownership of the state's islands; creation of a regional environmental study area in conjunction with public and private school programs; mobile homes park design; establishment of land trusts; secuing of easements; establishment of community conservations; creation of lake association.

Prior to the termination of the program in the Spring of 1971, 'How-To-Do-It' booklets developed as a result of these specific field experiences will be printed and made available to existing agencies. These can serve as guidelines for future efforts.

SUPPORTED BY Ford Foundation - New York, N.Y.

1.0114, DETERMINE ANNUAL DEER HARVEST

H.A. LARAMIE, State Fish & Game Department, *Concord, New Hampshire* 03301

Objective: To determine the number of deer harvested in Bear Brook State Park in 1968.

Procedure: Send a form letter and map of the Park and surrounding area to each hunter who killed a deer in a town in which the Park is located. Names and addresses will be obtained from deer checking station reports. Request each hunter to mark on the map where he killed his deer and return the map in the envelope provided. Tabulate and summarize the data received as was done in the W-12-R-18 report. If returns are received in time to include the 1968 data in the overall summary, it will be done.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0115, REVIEW OF STATUTES

D.E. SPRINGER, State Fish & Game Department, *Concord, New Hampshire* 03301

Project Objective: To analyze the present and future availability of private land in New Hampshire for recreational use by the public.

Job Objective: To document the New Hampshire statutes which apply to the public use of private lands and to assess the applicability of these statutes in light of landowner questionnaire reponses.

Procedures: A systematic review of New Hampshire statutes will be made, with the following Information recorded: chapter number, chapter title, subdivision number(s), subdivision title, and brief abstract of intent. In the questionnaire analysis, special attention will be paid to reference to these statutes in order to judge public awareness of the existence of these laws, as well as false impressions of the present statutes which may be held. The compiled list will be utilized in the recommending solutions to the present posting situation.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0116, THE FUTURE AVAILABILITY OF PRIVATE LAND FOR RECREATIONAL USE IN NEW HAMPSHIRE

D.E. SPRINGER, State Fish & Game Department, *Concord, New Hampshire* 03301

Project Objectives: To analyze the present and future availability of private land in New Hampshire for recreational use by the public.

Job Objectives: To project the posting situation into the future, to suggest approaches whereby land may be maintained for public recreation, and to publish findings in a report.

Procedures: Existing projections of population, accessibility, and urbanization will be used as a basis to project the posting situation into the future. Variables such as changes in existing laws, landowner attitudes, evolution of recreation activities, changing desires of recreationists will be considered in the projection procedure. Possible solutions will be recommended to provide equitable arrangements for public utilization of privately-owned land for recreation purposes. Five hundred copies of a final report covering all jobs will be submitted to the Department at the close of the project.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0117, ANALYSIS OF RESULTS OF QUESTIONNAIRE

D.E. SPRINGER, State Fish & Game Department, *Concord, New Hampshire* 03301

Project Objective: To analyze the present and future availability of private land in New Hampshire for recreational use by the public.

Job Objectives: To identify those factors which influence the posting of land in New Hampshire and to correlate this information with local town data for the purpose of expanding the sample data to reflect the statewide situation.

Procedures: Parametric statistical methods will be used to isolate those factor(s) which exert significant influence on the posting of land. Results will be correlated with a set of land/value/population density variables for each New Hampshire town. By matching sample towns with non-sample towns according to similarity of land/value/population density variables and responses to questionnaire, an estimation of the posting level in each New Hampshire town will be obtained.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0118, INVENTORY AND ATLAS OF MARINE SPORTFISHING FACILITIES

B. FREEMAN, U.S. Dept. of Interior, Bur. of Sport Fish. & Wildlife, *Highlands, New Jersey* 07732

A series of line maps will be prepared as an atlas and will summarize marine sport-fishing facilities and fishing grounds of the Atlantic coast from Maine to Florida. Intended as both a comprehensive guide for sportsmen and an inventory of facilities, each map will show locations of boating facilities, supplies, and services, as well as principal roads and towns. Water depths, fishing grounds, and common game fish will be indicated to a distance of ca. 30 miles offshore. The atlas will include location of natural and artificial reefs as well as principal wrecks. Tabular summaries accompanying each map will list fishing piers and public shore fishing areas, State and Federal parks, wildlife areas and associated recreational facilities.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0119, PRE-CONSTRUCTION ENVIRONMENTAL SURVEY OF EXPERIMENTAL ARTIFICIAL REEFS

L. OGREN, U.S. Dept. of Interior, Bur. of Sport Fish. & Wildlife, *Highlands, New Jersey* 07732

Conduct an ecological, hydrographic and geological investigation of potential reef sites from New England to Florida by periodic underwater observations at each area selected for construction. Sampling techniques will depend upon water conditions and diver support facilities at each locality. Observations will be made on the existing fish fauna and benthic organisms using standard sampling methods, i.e., swimmer transects, timed observation periods, and random quadrants. Faunal collections for identification and bottom samples for sediment analysis will be taken at each locality. Water temperature, salinity, transparency, and current direction and velocity will be recorded at the construction sites. Natural reefs and other bottom discontinuities in the construction areas will be investigated in order to evaluate the reef fishing potential for each region.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0120, HYDROGRAPHY OF NEW YORK BIGHT IN RELATION TO OFFSHORE WASTE DISPOSAL

R.I. WICKLUND, U.S. Dept. of Interior, Bur. of Sport Fish. & Wildlife, *Highlands, New Jersey* 07732

Study the hydrography of the New York Bight with particular emphasis on conditions having a direct effect on the movements of waste disposal.

Measure and analyze temperature and salinity throughout the water column at 26 stations every two weeks, and release 300 sea bed drifters and drift bottles once a month.

Establish stations, utilizing sub-surface buoys, at six locations equipped with thermographs located at the bottom and in midwater. Supplemental buoy stations may be added to verify hypothesis developed from interpretation of regular station data.

Temperature, salinity, and density determinations to be plotted on horizontal and vertical profiles and drifter, current meter, and thermograph data processed and analyzed by computer techniques.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0121, WATERFOWL HARVEST

F. FERRIGNO, State Div. of Fish & Game, *Trenton, New Jersey* 08625

Objectives: To determine the number of waterfowl that are harvested and which utilize specific tidal marshes, Cape May County. In addition, efforts will be made to correlate the effects of harvest on the local wintering black duck populations and the value of certain marshes to the hunter.

Procedures: Fifteen ground counts will be made to determine the number and species utilizing the State-owned tidal marshes from September to January. This data will be compared with hunter bag checks which will be conducted at the main docking area of the Dennisville Tract. Sex and age, species composition, and other data pertinent to the study will be conducted.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0122, MOSQUITO CONTROL - TIDAL MARSHES

F. FERRIGNO, State Div. of Fish & Game, *Trenton, New Jersey* 08625

Objectives: Chemical and physical evaluation to provide adequate control of mosquitoes on tidal marshes. Also, to evaluate their effects on other marsh organisms as well as the water, soil, and other interests.

Procedures: Over the years this study has supplied us with much information on the problems associated with coastal mosquito - wildlife management interests. Studies to be undertaken pertaining to transporting and building up of residual insecticides on marshes or within marsh organisms. Accordingly, it is urgent that an organization equipped with facilities to determine the chemical analyses of water, soil, salt bay eggs, micro and macro-organisms, and tissues, cooperate in the study. Every effort should be made this year to determine the 'hidden effects' of these chemicals in this environment. In addition, experimentation will continue on open marsh water management in an effort to provide long-lasting control of mosquitoes and a better environment for fish and other wildlife. Ponding and ditching will be evaluated.

This study will eventually lead to control of pestifereous insects, improvement of the tidal food web, and eventually elimination of insecticide from tidal marshes. Over 2000 acres of heavy mosquito breeding marshes have been controlled by open marsh water management.

Chemicals are no longer needed on these areas and organisms of the food web are increasing.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0123, CONTROLLING MOSQUITOES ON HAYING MEADOWS

F. FERRIGNO, State Div. of Fish & Game, *Trenton, New Jersey* 08625

Objectives: To evaluate chemical and/or physical control of mosquitoes on diked salt hay meadows from the standpoint of its effect on vegetation, water, soil and marsh organisms.

Procedures: Mosquito control treatments on haying marshes will be evaluated by making mosquito larval dippings, plankton samples, soil analysis, cover-typing, wildlife population and utilization censuses, and bag checks.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0124, MOSQUITO CONTROL IN UPLAND SWAMPS

F. FERRIGNO, State Div. of Fish & Game, *Trenton, New Jersey* 08625

Objectives: To determine the effects of mosquito control practices (water management or insecticide applications) on the upland fauna.

Procedure: After an upland swamp has been treated with an insecticide or ditched, larval dippings, cover-typing, collection of pesticide samples, and wildlife population and utilization counts will be made and compared with an untreated swamp.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0125, WATER MANAGEMENT IN MOSQUITO IMPOUNDMENTS

F. FERRIGNO, State Div. of Fish & Game, *Trenton, New Jersey* 08625

Objectives: To carry on investigations on the effects of diking, pumping, and lowering the water table in impoundments managed for mosquito control.

Procedure: There are many problems that will have to be studied in this environment such as population, fresh water reserves, salt water intrusion, mosquito production and wildlife use. After evaluating the effects of present management, recommendations will be made to satisfy a multiple of interests.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0126, HYDROLOGIC AND CAVE CLIMATE STUDY OF CARLSBAD CAVERNS

J.S. MCLEAN, U.S. Dept. of Interior, Geological Survey, *Albuquerque, New Mexico* 87106

Continuous monitoring of humidity, carbon dioxide content of the cave atmosphere and temperature at three locations in the

Caverns are supplemented with spot measurements of evaporation, air flow, temperature, relative humidity, carbon dioxide and water levels in pools. The effects of lighting the cave, paving the area over part of the cave, and air circulation up the elevator shaft are compared using these data.

The field work is conducted in Carlsbad Caverns, New Mexico. The interpretation is conducted at the U. S Geological Survey Water Resources Division office at Albuquerque, New Mexico.

SUPPORTED BY U.S. Dept. of Interior - Natl. Park Serv.

1.0127, CANADARAGO LAKE EUTROPHICATION STUDY

L.J. HETLING, State Dept. of Env. Conserv., *Albany, New York* 12205

The nature and causes of eutrophication of lakes is being studied. A detailed study is being made on Canadarago Lake, Otsego County, New York. Data collection and sampling on the lake began in May, 1968, in order to establish its physical, hydrological, chemical, and biological characteristics. From this basic data more specific engineering control mechanisms such as advanced waste treatment, improved individual summer home waste disposal methods, agricultural practices, diversion of land run-off, etc., will be evaluated.

The objectives of the 1970-71 FY are: 1. Calculate a nutrient balance to determine the temporal and spatial variations in nutrient loadings to the lake. 2. Construct a mathematical model capable of representing the effort of man-made changes on the quality state of the lake. 3. Laboratory studies have indicated phosphorus is the key element which limits algae growth in this lake. Utilizing the nutrient balance formula information and the mathematical model, the probable effect of various engineering control measures for phosphorus reduction will be evaluated. 4. Construction of a sewage treatment plant for the Village of Richfield Springs is expected to be completed during 1970. Field studies to evaluate the effect of this treatment plant on the lake will be carried out. 5. Nutrient balance data indicates that farm land run-off is a major source of nutrients. A study of methods for controlling the agricultural land run-off will be carried out. 6. Develop an effective land management plan for reduction of agricultural run-off. This plan will be required because of the diverse agencies involved which have authority in agricultural land use.

SUPPORTED BY New York State Government - Albany

1.0128, CARBONATE EQUILIBRIA IN LAKE ERIE

K.G. WOOD, State University of New York, Graduate School, *Fredonia, New York* 14063

To determine the relationships between total alkalinity, pH, temperature and total CO2 for Lake Erie Water. Total CO2 is determined by gasometric method. Initial results show that ion complexes may form at pH 9 and above.

SUPPORTED BY No Formal Support Reported

1.0129, SYSTEMATIC STUDY AND DEVELOPMENT OF LONG-RANGE PROGRAMS OF URBAN WATER RESOURCES RESEARCH

M.B. MCPHERSON, Amer. Soc. of Civil Engrs., *New York, New York* 10017 (C-1804)

ASCE is assisting in outlining, developing and initiating a coordinated national program of urban water resources research. Long- range studies of all types of urban water problems are being implemented through coordinated projects, centrally directed. Deliberate and systematic study of urban water problems on a comprehensive basis had long been neglected

General objectives of the project include: studies of needs and justification for research on urban water problems; identification of high priority and key research needs; development of logical methods and means for accomplishing or at least initiating needed research; stimulation of and collaboration in complementary or parallel studies on portions of the overall program by municipalities, research firms and universities; initiation and pursuit of research and development on key and immediate needs; establishment of an efficacious method and appropriate media to facilitate incorporation of research findings into practice; and establishment of a formal or informal information exchange system for use in continuing research on urban water problems.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0130, CHANGES OF PHYSICAL SITE CHARACTERISTICS AT ADIRONDACK CAMPSITES AT FIVE-YEAR INTERVALS

H.E. ECHELBERGER, State University of New York, U.S.D.A. Forest Service, *Syracuse, New York* 13210

To provide information on the long term response of vegetation at camp sites in the Adirondack Forest Reserve of New York.

SUPPORTED BY U.S. Dept. of Agriculture

1.0131, DISSIPATION RATES OF SELECTED NOISE LEVELS ENCOUNTERED IN OUTDOOR RECREATION ENVIRONMENTS

H.E. ECHELBERGER, State University of New York, U.S.D.A. Forest Service, *Syracuse, New York* 13210

To describe the dissipation rates of selected producers of noise in recreation environments.

SUPPORTED BY U.S. Dept. of Agriculture

1.0132, FORECASTING FUTURE EVENTS IN RECREATION EQUIPMENT AND ENVIRONMENTAL TECHNOLOGY

E.L. SHAFER, State University of New York, U.S.D.A. Forest Service, *Syracuse, New York* 13210

Because forest recreation management is influenced greatly by technological development, forest recreation management policy must anticipate and prepare for those technological advances that affect recreation demands on forest land. The objective of this study is to forecast the changes that may occur throughout the United States between now and the year 2,000 in outdoor recreation equipment design and environmental control. Opinions of one hundred experts in each of four different fields--recreation equipment technology, recreation environment technology, recreation resource legislation, and physical and biological technology--will be questioned about their predictions of the occurrence of specified future events. The Delphi Technique of repeated summary mailings will be used as the method of data collection.

SUPPORTED BY U.S. Dept. of Agriculture

1.0133, RELEVANT FACTORS IN SELECTED RECREATION-DEVELOPMENT DECISIONS

E.L. SHAFER, State University of New York, U.S.D.A. Forest Service, *Syracuse, New York* 13210

Decision-makers and recreation researchers need auxiliary aids to isolate key elements in management decisions that affect recreation demand. The purpose of this study is to isolate these relevant features in the decision-making process by constructing a basic decision framework--or relevance tree--within which interrelated variables that affect recreation programs can be evaluated on a quantitative basis. Recreation decision-makers from various governmental agencies will be presented with a spectrum of recreation planning situations and will be asked to rank and weigh the social and physical considerations that enter into each planning decision. Key elements will be isolated for each decision and comparisons will be made between key elements entering into different kinds of decisions within and between government agencies. The key decision elements isolated in the study should provide guidelines on where research effort should be concentrated to improve the recreation decision-making process.

SUPPORTED BY U.S. Dept. of Agriculture

1.0134, PREDICTING THE ESTHETIC APPEAL OF NATURAL LANDSCAPES

E.L. SHAFER, State University of New York, U.S.D.A. Forest Service, *Syracuse, New York* 13210

To test whether pattern measurements and tonal variations of given landscape configurations are significantly related to public preference for that landscape. Scheduled for completion in 1969.

SUPPORTED BY U.S. Dept. of Agriculture

1.0135, TRAIL PAVEMENT SECTIONS - WAITEMATA COUNTY

F.G. JONES, Waitemata County Council, *New Zealand*

Eight alternative pavement types each of 330 feet are being constructed as part of a seven mile reconstruction contract on a country road which will carry recreational traffic of up to 10,000 vehicles per day. Performance of local materials is to be determined. The alternatives include untreated high quality base course, cement treated and bitumen treated local aggregate, use of medium quality local aggregate as subbase, and lime stabilization of the insitu subgrade clays. (IRF)

SUPPORTED BY New Zealand Government

1.0136, A PROGRAM FOR THE CONTINUING ACCUMULATION & MANAGEMENT OF NATIONAL FOREST RECREATION INFORMATION FOR PURPOSE OF RESOURCE MANAGEMENT & RES

G.A. JAMES, U.S. Dept. of Agriculture, S.E. Forest Experiment Station, *Asheville, North Carolina* 28802

Provide for the collection, storage, analysis, and retrieval of a wide variety of data on all recreation sites and areas of the National Forest System, including both their biological and physical characteristics and condition, and the volume and kinds of use they support. Continuing.

SUPPORTED BY U.S. Dept. of Agriculture

1.0137, A STUDY TO DETERMINE WHICH NATIVE AND INTRODUCED UNDERSTORY TAXA ARE BEST SUITED FOR PLANTING ON DEVELOPED RECREATION SITES

G.A. JAMES, U.S. Dept. of Agriculture, S.E. Forest Experiment Station, *Asheville, North Carolina* 28802

To determine which native and introduced understory taxa (grasses, shrubs, and trees) are best suited for planting on heavily used developed recreation sites in the Southern Appalachians, as affected by timing and intensity of overstory density reduction and controlled mass recreation use.

SUPPORTED BY U.S. Dept. of Agriculture

1.0138, A STUDY OF UNDERSTORY VEGETATION RESPONSE TO SEVERAL LEVELS OF OVERWOOD DENSITY REDUCTION

G.A. JAMES, U.S. Dept. of Agriculture, S.E. Forest Experiment Station, *Asheville, North Carolina* 28802

To determine relations between timing and intensity of overstory density reduction, controlled mass recreation use, and the response of understory vegetation on a developed recreation site in the Southern Appalachians.

SUPPORTED BY U.S. Dept. of Agriculture

1.0139, PILOT TEST OF SAMPLING PROCEDURES FOR ESTIMATING RECREATION USE OF LARGE BODIES OF WATER

G.A. JAMES, U.S. Dept. of Agriculture, S.E. Forest Experiment Station, *Asheville, North Carolina* 28802

To pilot test a sampling plan for estimating recreation use which occurs on bodies of water of such size and shape that air observation is needed to obtain information on which use estimates can be based. The method is designed to yield use estimates that can be revised (updated) annually, based on an easily obtained indicator of use such as traffic- flow pattern.

A pilot study was successfully completed during 1968 on two lakes in eastern Oregon. Two demonstration tests of the sampling technique are being conducted during 1969 on the Allegheny Reservoir in Pennsylvania and on the Watauga Reservoir in Tennessee.

SUPPORTED BY U.S. Dept. of Agriculture

1.0140, PILOT TEST OF SAMPLING PROCEDURES FOR ESTIMATING MASS AND DISPERSED TYPES OF RECREATION USE ON AN ENTIRE NATIONAL FOREST

G.A. JAMES, U.S. Dept. of Agriculture, S.E. Forest Experiment Station, *Asheville, North Carolina* 28802

The primary objective is to pilot test a sampling plan for estimating dispersed types of recreation use of the Teton National Forest, Wyoming; a forest consisting of four Ranger Districts. The method is designed to yield use estimates that can be revised (updated) annually, based on an easily obtained use indicator.

SUPPORTED BY U.S. Dept. of Agriculture

1.0141, PILOT TEST OF SAMPLING PROCEDURES FOR ESTIMATING USE ON WILDERNESS-TYPE AREAS

G.A. JAMES, U.S. Dept. of Agriculture, S.E. Forest Experiment Station, *Asheville, North Carolina* 28802

Pilot test a sampling plan for estimating amounts, types, timing, and location of dispersed recreation use that occurs in wilderness. The technique is designed to yield use estimates that can be revised annually, based on one or more related indicators of use (predictor variables). A 1968 test was conducted on the Mission Mountains Primitive Area in Forest Service Region I. A revised sampling model, incorporating use of electric-eye counters on all trails, is being conducted during 1969 on the San Gorgonio Wilderness area in Forest Service Region 5. The sampling model is being further tested during 1970 on the Rawah Wilderness in region 2.

SUPPORTED BY U.S. Dept. of Agriculture

1.0142, INVENTORY AND MEASUREMENT OF RECREATION USE

G.A. JAMES, U.S. Dept. of Agriculture, S.E. Forest Experiment Station, *Asheville, North Carolina* 28802 (SE1901)

Objective: Develop principles and guides to enhance recreational use benefits from forests and other wild lands of the Southeast.

Approach: Improve methods for collecting and processing information on area and site characteristics, and use. Design and test a system to compile, store and retrieve facility and use data for all National Forest recreation lands. Studies aimed at maximizing the use of fish and game resources, including the availability and use of access roads and trails. Studies of the Southeast's cold water fishery resource will involve an assessment of its nature, amount and worth. Improvement of the selection, design and management of recreation sites will be sought by studies of criteria for site value, and design and facility layout including manipulation and restoration of problem sites, measurement of carrying capacity, and choice of horticultural materials.

Progress: To keep pace with rapidly changing and continually growing demands for recreation opportunities of the National Forests, resource managers must have current, readily available information. A centralized statistical unit was established in 1965 within the Project- -in cooperation with the Washington Office Division of Recreation--to provide rapid retrieval of a wide variety of detailed recreation information. The computerized system, known as RIM (Recreation Information Management), is now fully operational. During the year, source documents--repositories of information on various management aspects--were developed for the following elements. Basic address-- Location and status of all Forest Service recreation sites and areas. Recreation use.--Current estimates of use on a [illegible]y-site and area- by-area basis. Facility inventory: A complete inventory of all site and area facilities. Recreation use sampling models: Several sampling models were developed and tested nationwide during the year and estimate use of developed sites, general forest areas, winter-sports sites, and wilderness areas. Numerous documents were prepared for the Washington Office to answer requests for information from the Bureau of Outdoor Recreation and other Federal and State Agencies.

SUPPORTED BY U.S. Dept. of Agriculture

1.0143, A FULLER LIFE FOR AMERICA: THE NATIONAL RECREATION ASSOCIATION AND THE CONSTRUCTIVE USE OF LEISURE, 1906-1966

R.F. KNAPP, Duke University, Graduate School, *Durham, North Carolina* 27706

This project is a study of the evolution of the ideas and actions of the National Recreation Association and their effect on recreation in twentieth-century American society. It is hypothesized that the work of the Association centered around four clusters of ideas: promotion of governmental, especially local, responsibility for the provision of opportunity for recreation; a broadening definition of recreation; recognition of the need for a creative use of leisure; and emphasis upon leadership training and quality. The research will attempt to relate recreation and the Association to the broader stream of American history and culture, including such areas as physical education, social work, parks, government, planning, and education. The principal research sources include printed material, the files of the National Recreation and Park Association, the National Archives, and interviews and correspondence with former Association workers and other leaders in recreation.

SUPPORTED BY National Academy of Sciences - Washington

1.0144, RECREATION PLANNING ASSISTANCE

M.V. RULISON, Res. Triangle Institute, *Durham - Research Triangle Pk., North Carolina* 27709

In this project professional and technical services are being supplied to the Recreation Division, Department of Local Affairs, to assist in revising the State Comprehensive Outdoor Recreation Plan. Tasks included in the project are preparing a popular summary of the present Statewide Comprehensive Outdoor Recreation Plan, analyzing the demand of North Carolinians for outdoor recreation, specifying procedures for updating the inventory of existing recreation sites, assembling data on current use of State and Federal recreation sites, and assisting in establishing standards for recreation supply.

SUPPORTED BY U.S. Dept. of Interior - Bu. Outdoor Rec.

1.0145, COMPREHENSIVE OUTDOOR RECREATION PLANNING FOR THE STATE OF SOUTH CAROLINA

M.V. RULISON, Res. Triangle Institute, *Durham - Research Triangle Pk., North Carolina* 27709

The objectives of this project were to assist the South Carolina Department of Parks, Recreation, and Tourism in developing a comprehensive outdoor recreation plan, including: 1) estimates of demand for outdoor recreation, 1970-1985, 2) recommendations on the form of tabular analysis for the inventory of outdoor recreation sites and review of results of inventory, 3) calculation of needs for recreation lands based upon the above data.

Since this research supported a comprehensive, statewide plan, demand analysis focused upon the basis of recreation demand--total population in each country, district, or region. It related land needs to that total population, taking into account a few readily available population characteristics such as density of settlement and level of income. Needs for Bureau of Outdoor Recreation Land Classes I and II were measured in terms of acres of land of various types--for playgrounds and playfields, city parks, county or regional parks, and state parks. Definite land standards were established, and counties and other areas compared with the standards, to identify areas of unmet demand for which additional recreation areas should be created.

For BOR Classes III, IV, V, and VI the analysis proceeded by comparing the quantity of such lands in each county with the amount in district and state averages--on a per capita basis. The aim here was to provide recreation planners with an indicator of where lands of these types are least and most available at present so that they might know the effects of seeking additional acreage for these classes in each county.

SUPPORTED BY U.S. Dept. of Interior - Bu. Outdoor Rec.

1.0146, GRASSES AND OTHER PLANTS FOR LAWNS, RECREATIONAL AREAS, ROADSIDES, AND OTHER TURF USES

W.B. GILBERT, Univ. of North Carolina, Agricultural Experiment Sta., *Raleigh - N.C. State Univ., North Carolina* 27600 (NC05104)

OBJECTIVE: Study the establishment and maintenance of grasses and other plants for turf uses.

APPROACH: Experiments will be established in various locations in North Carolina to study the differential biotic, soil, and climatic environments as to their effects on turf establishment and maintenance. Wherever possible, the experiments will be conducted cooperatively with specialists in other departments, with existing research stations, and the Department of Highways. Data will be obtained on the ease and speed of obtaining good turf. Turf maintenance will be investigated and data obtained on ground cover, height, color, persistence, texture, botanical composition, weed encroachment, disease, insects, and other factors.

PROGRESS: Fine Turf. Different ratios of N, P, and K on the low temperature killing point of T328 and Tifdwarf bermudagrasses were studied. A ratio high in N was optimum of those tested for increasing low temperature survival. Plants which had received a high N ratio were the least resistant to cold, but P and K improved tolerance. The alteration of the soluble protein fractions in the rhizomes of the two grasses during cold hardening was investigated, with several changes in the band patterns being observed. The results indicate how cold acclimation changes the protein fractions and that through proper fertilization practices this cold tolerance may be improved. The Highway Research Program concluded with a final report, giving the following recommendations: Wood cellulose would be an acceptable substitute for straw as mulch material during optimum seeding periods. Fiberglass could be used in areas where conventional mulches would not be satisfactory. The fertility program at seeding would be a 3-3-1 ratio, with 150 pounds N per acre (1/3 available and 2/3 slow release), and one to two tons lime in seedbed with one ton added every five years. Species recommended are tall fescue, sericea lespedeza, and crownvetch in mountains and Piedmont, bermuda and bahiagrass in Coastal Plain. For ditch lining materials, fiberglass and excelsior were superior to jute netting. Use of these recommendations would result in better turf and a reduction in maintenance costs.

SUPPORTED BY North Carolina State Government

1.0147, CONTRIBUTION OF VARIOUS QUALITATIVE FACTORS TO RECREATIONAL VALUE OF SOUTHERN APPALACHIAN TROUT FISHERY (ABBREV)

D.R. TALHELM, Univ. of North Carolina, Graduate School, *Raleigh - N.C. State Univ., North Carolina* 27600

To determine the overall value of part of the Southern Appalachian trout fishery to fishermen, and to determine the relative contributions of various qualitative aspects of the resource to its overall value. Scheduled for completion in 1970.

SUPPORTED BY U.S. Dept. of Agriculture

1.0148, ECOLOGY OF SAND DUNES IN RELATIONSHIP TO THEIR STABILIZATION

W.W. WOODHOUSE, Univ. of North Carolina, School of Agriculture, *Raleigh - N.C. State Univ., North Carolina* 27600

Study adaptation, propagation and fertilization of dune plants, use of dune plants in growing and shaping dunes, development of superior varieties of dune plants.

Initiated FY 1960-61 revised, 1969, and broadened to include stabilization and productive use of dredge spoil. This involves initially determining requirements for establishment and growth of Spartina alterniflora and the development of procedures for establishing this plant on dredge spoil in North Carolina sounds and estuaries. Field work presently in vicinity of Oregon, Hatteras and Beaufort Inlets. Interim reports are available.

To be completed or revised 1974.

SUPPORTED BY U.S. Dept. of Interior - Natl. Park Serv.

1.0149, STATE OUTDOOR RECREATION PLAN

C. SEIBEL, State Outdoor Rec. Agcy., *Bismarck, North Dakota* 58501

The Plan is based on series of continuing background papers, each to be updated and revised to meet specific scheduling. Each deals with a specific phase or element of comprehensive statewide outdoor recreation planning. Subjects, and relation to water resource planning include: The Regional Setting - comparison of water availability in North Dakota and surrounding states and provinces; Resources - quantity, quality of the state's water resources; Land Use - extent of water resources, potential future extent; Participation and Preferences (Demand) - amount of water area, access, quality, etc., needed for outdoor recreation activities including swimming, boating, water skiing, fishing, aesthetics, etc.; Present Recreation Opportunities - intensively managed fishing lakes, developments of recreation on existing water areas, quality indices applied to supply data; Standards of Capacity and Seasonal Use - amount of water areas, quality of experiences, needed to sustain use; Outdoor Recreation Needs - mathematical comparison of supply, standards and demand; Responsibilities - legal implications of programs related to outdoor recreation including PL 89-72; Plans of Others - proposed developments of water resources for recreation and related uses; Game and Fish in North Dakota - suitability of various sizes of impoundments, lakes, streams, for fish habitat and wildlife propagation; Outdoor Recreation in North Dakota (condensed version of plan) summary of data on water resources and other matters; Impact of Garrison Diversion on Outdoor Recreation in North Dakota - a study of recreation and reclamation; Recreation for North Dakota's Disadvantaged Persons - how water resources can provide recreation for the handicapped; The Lewis and Clark Trail - a special area study of the Trail route and its relation to federal reservoirs; The Turtle Mountains - a special area study of the water resources of an outstanding recreation area of North Dakota; Interim Action Program - a comparison of needs for water and land oriented recreation with the potential and financial possibilities of action. In North Dakota's outdoor recreation planning careful attention is paid to all matters relating in anyway to water resources since they are a very vital part of the outdoor recreation picture.

SUPPORTED BY U.S. Dept. of Interior - Bu. Outdoor Rec.

1.0150, FISHERIES INVESTIGATIONS OF GREENLEAF AND SPORTSMAN LAKES

J. EDGINGTON, State Dept. of Wildlife Cons., *Oklahoma City, Oklahoma* 73105

Objective: To measure the combined effects of (1) drawdown; and (2) vegetation cover, on fish populations, fishing and related recreation time in a 329 acre warm water reservoir.

Procedures: 1. Measure and correlate total recreation and fishing man-days by traffic counters and interviews.

2. Determine changes in the fish population by annual sampling.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0151, ESTABLISHING FOREST TREES ON GORSE AREAS

R.K. HERMANN, Oregon State University, Graduate School, *Corvallis, Oregon* 97331 (ORE00595-F)

OBJECTIVE: Investigate the possibility of controlling gorse biologically through planting of Monterey pine.

APPROACH: After clearing heavily gorse-infested land, Monterey pine will be planted. Growth of Monterey pine and resprouting gorse will be measured annually. Environmental changes brought about by the development of Monterey pine and their effect on gorse will be investigated.

PROGRESS: Gorse infests about 120,000 acres in southwestern Oregon, constitutes a tremendous fire hazard, impairs recreational use of coastal areas and prevents economic yields from land. Douglas-fir (Pseudotsuga menziesii) and Port Orford cedar (Chamaecyparis lawsoniana) were planted near Port Orford, Oregon in 1946 by State Forestry Department personnel. Lodgepole pine (Pine contorta) and maritime pine (Pinus maritima) were added to the tests in 1948 by D. P. Lavender. Poor survival, growth, or vigor coupled with disease eradicated most of the trees. Monterey pine (Pinus radiata), first planted in 1953, was planted more extensively in 1961. Annual examinations had shown this to be the only species that grew fast enough to stay ahead of the re- sprouting gorse. Analysis indicates seedlings at least one-foot height at planting can compete successfully with gorse.

SUPPORTED BY Oregon State Government

1.0152, GETTYSBURG BATTLEFIELD AREA PLANNING & RESEARCH DEMONSTRATION PROJECT

B. HEARN, State Dept. of Community Afrs., *Harrisburg, Pennsylvania* 17120

The ultimate goal of the project is to protect the historic heritage of the privately held areas surrounding the Gettysburg National Battlefield site through coordination of local and National Park Service planning.

The grant was made by the Dept. of Housing & Urban Development to the Pennsylvania Dept. of Community Affairs which is coordinating and providing technical supervision for comprehensive planning in Cumberland Township and Gettysburg Borough. The technical phases of the project are being carried out by Wallace, McHarg, Roberts and Todd of Philadelphia. The identification of the present characteristics relative to the study area has been completed and the plan development stage of the project is now in progress.

Also participating in the demonstration project are the National Park Service, Adams County, and a technical committee representing the two local municipalities involved in the study.

SUPPORTED BY U.S. Dept. of Housing & Urban
Development

1.0153, ESTABLISHING DESIGN CRITERIA FOR SAFE SKI BINDINGS

L.D. SHER, Univ. of Pennsylvania, School of Engineering, *Philadelphia, Pennsylvania* 19104

The annual toll of major injuries to the legs of United States skiers could be sharply reduced if the skis always were released from the skier under injury-producing circumstances. This project has as its goal the formulation of criteria for safe ski bindings--ones which hold reliably during skiing and release reliably before injury.

Establishing the criteria will be done in two parts: (a) Measure the forces and torques generated between ski and boot during normal skiing. This data will be collected by radio telementry and analyzed by modern, high-speed data-processing equipment. (b) Estimate from the data available what forces and torques are necessary to cause injuries, particularly the types common to skiing.

If these criteria are formulated in terms of the skier, i.e., his weight, age, expertise, etc., then non-adjustable, perfectly-releasing bindings could be designed which would protect the skier under all conditions of environmental stress.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - P.H.S.

1.0154, STREAM POLLUTION AND RECREATION

H.B. GAMBLE, Penn. State University, Inst. For Res. on Land & Water, *University Park, Pennsylvania* 16802

The basic hypothesis in the proposed research is that there is a negative correlation between the degree of pollution and the intensity of recreational use of streams. The major objective is to examine a number of streams in Pennsylvania in order to derive estimates of one of the social costs of pollution - that of recreational development and use foregone.

Field investigations will include the selection of a number of streams or stretches of streams throughout Pennsylvania showing varying degrees of recreational use. Variables other than pollution which affect recreational use and development along any given stream will have to be accounted for. A detailed study of the degree and kinds of pollution will be made, and will involve physical and chemical testing of the waters as well as development and application of schematic scaling techniques for the aesthetic and nonbiochemical qualities of the water and environs. Detailed data will be gathered through field interviewing as to the amount and kinds of expenditures by recreational users of streams.

Regression analysis will be the statistical tool employed to describe the relationship between direct and indirect expenditures from recreationists and kind of stream pollution and the control factors.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0155, REDUCTION IN DAMAGES TO FOREST RESOURCES BY IMPROVEMENT OF STRIP-MINING METHODS AND REHABILITATION MEASURES

G. DAVIS, U.S. Dept. of Agriculture, N.E. Forest & Range Expt. Sta., *Upper Darby, Pennsylvania* 19082

Strip-mining disturbs extensive areas in the Appalachian Mountains and creates problems of runoff and erosion until stabilized and revegetated by proper reclamation measures. Weeping lovegrass provides the best initial cover on extremely acid spoils. Spoil pH may be used to predict manganese toxicity in legumes planted on strip-mined lands. Lime is essential to the establishment of crownvetch on coal breaker refuse.

Chemical pollutants in streamflow increase but suspended sediments decrease six months after mining a watershed. Load bearing strength of coal haul roads can be improved by the addition of asphalt compounds. Spoil slides are more likely to occur in the valleys and on steeper slopes in contour strip-mining.

Additional studies are underway which are aimed at evaluating various spoil treatment on runoff and erosion reduction from strip mined areas. Further research is being carried out in the evaluation of various grasses, shrubs, and tree species in conjunction with site preparation and fertilization. Aerial application of seed and fertilizer is being studied.

The actual studies are being carried out at Berea, Kentucky; Princeton, West Virginia; and Kingston, Pennsylvania.

The project was started in 1963 with various studies being initiated and others completed at various times. No completion date has been set for the project as a whole.

SUPPORTED BY U.S. Dept. of Agriculture

1.0156, INVESTIGATIONS OF THE BIOLOGY AND CONTROL OF NOXIOUS COELENTERATES OCCURRING IN THE COASTAL WATERS OF PUERTO RICO (FIRST YEAR)

C.E. CUTRESS, Puerto Rican Dept. of Agri., *Santurce, Puerto Rico*

The objectives of the first year operation are to initiate a survey of the type, incidence and severity of injury to bathers resulting from contact with marine invertebrates; survey the occurrence and distribution of noxious coelenterates in coastal waters of Puerto Rico; to initiate investigation of the life histories of noxious jellyfish of primary importance; and, to investigate means of controlling these jellyfish.

Procedures: Physicians will be consulted and asked to cooperate; surveys will be made in marine recreational areas to determine presence of harmful jellyfish; records will be prepared of the related environment; collections of noxious jellyfish will be made and studied; when sufficient information is available to determine which jellyfish warrant control an attempt will be made to devise and test control measures.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

1.0157, SPECIES COMPOSITION, DISTRIBUTION, AND MIGRATORY HABITS OF LARGE SHARKS

J.G. CASEY, U.S. Dept. of Interior, Marine Game Fish Research Lab., *Narragansett, Rhode Island* 02882

Determine the species composition, distribution and migratory patterns of sharks occurring in North Atlantic coastal waters from Maine to North Carolina.

The plan of work is to: (1) tag sharks in the course of long line fishing operations conducted by the Atlantic Marine Game Fish Program under an additional shark study project; (2) supply tagging materials and instructions to cooperating sportsmen and sporting clubs; (3) continue tagging through October 1969, after which time tag return data will be collected and analyzed.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0158, THE IMPACT OF IMPOSING A WATER QUALITY STANDARD ON A LIVE STREAM

J.N. DORNBUSH, South Dakota State University, School of Engineering, *Brookings, South Dakota* 57006

This proposed study involves an evaluation of the impact of imposing quality standards on a stream which is presently being considered for multipurpose development through reservoir construction.

Water resources development frequently requires long-range decisions involving huge expenditures; however, these decisions are often made without complete consideration of existing information. It is the purpose of this study to appraise information for decision- making regarding beneficial uses including flood control, recreation, irrigation, fish propagation and quality control.

The approach will be to evaluate statistically existing information in order to relate the proposed quality requirements to the projected uses. The case study will consider the interrelationships of existing and projected stream quality, the frequency of low stream flows, the pollution abatement requirements, the effect of river impoundment and the need for flow augmentation.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0159, BLACK-FOOTED FERRET RESTORATION

R. LINDER, South Dakota State University, State Coop. Wildlife Res. Unit, *Brookings, South Dakota* 57006

The black-footed ferret, one of America's rarest mammals, is no longer found in any of the National Park Service areas where it was once present. Considerable search has finally revealed the presence of a few specimens at sites in the northern Great Plains. These animals are being studied intensively with the objective of learning their habitat requirements, more about their life history and limits of tolerance, behavioral characteristics, food habits, reproductive potential, etc., in the hope that the animals can be reintroduced and populations preserved in several National Monuments.

Reports are available from principal investigator.

Scheuled completion date - current phase Feb. 1972.

SUPPORTED BY U.S. Dept. of Interior - Natl. Park Serv.

1.0160, RECREATIONAL TRIP CHARACTERISTICS ON MAIN URBAN ACCESSES

M. GULLON, Generale Dir. of Highways, *Madrid, Spain*

Document Provided by Highway Research Information Service.

SUPPORTED BY No Formal Support Reported

1.0161, PLANNING OF RECREATIONAL AREAS

E. ODMANN, Natl. Swedish Inst. Bldg. Res., *Stockholm, Sweden*

Objective - To draw up guiding principles for the planning of recreational areas in the town at different distances from the urban area.

SUPPORTED BY Swedish Government

1.0162, CREEL SURVEY

J.D. LITTLE, State Game & Fish Commission, *Nashville, Tennessee* 37203

Objectives: To study the Dale Hollow Reservoir fishery with emphasis placed on determining the most efficient and economical methods of establishing a rainbow trout fishery.

Procedure: Approximately 1,000,000 rainbow trout will be stocked in Dale Hollow Reservoir annually for three years. All fish will be marked; fishing pressure, total catch, fishing success, percent return of stocked trout, and the economic value of the fishery will be estimated by using a creel survey designed by Dr. Don Hayne, Institute of Statistics, North Carolina State University, and biologists of the Tennessee Game and Fish Commission.

Two day census creel clerks will work five days each week. The lake will be divided into two major areas, with a clerk assigned to each. One area will be divided into five sub-areas and one into four sub-areas. A clerk will work one sub-area each work day.

The work day for the day clerks will be from one-half hour before sunrise to one-half hour after sunset, and will be divided into two periods with 12:00 Noon (Standard time) separating the periods. Each clerk will work one period per day.

There will be three possible times during each period that a fisherman count can be made. A progressive count will be used and each count time will require approximately two hours. The clerk will make a fisherman count during one of the count times each day, and will spend the remaining part of the time interviewing fishermen in the selected sub-area collecting data on catch and percent return of stocked trout. (Text Abridged)

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0163, THE QUANTITATIVE DETERMINATION OF LEAD IN LAKE WATER VIA ATOMIC ABSORPTION SPECTROPHOTOMETER

H.D. MCAFEE, Univ. of Texas, Undergraduate School, *Arlington, Texas* 76010

The object of this work was to determine the adaptability of atomic absorption spectrophotometric techniques to the study of water pollution in terms of lead, cadmium, and other heavy metals. It was determined that these techniques could indeed be used in the detection of lead in trace (less than 0.2 mg/l) amounts.

The first series of tests were made on water from a lake which is used for municipal supply and for recreational purposes. Contamination of the water by lead tetraethyl was not apparent even though boat traffic on the lake is quite heavy. More tests will need be made in order to insure more complete coverage of the lake.

It is highly probable that this type of instrument can be used to help establish the quality of drinking water supplies. Furthermore, since it is desirable that heavy metal ions not be discharged into ordinary sewage treatment plants, this instrument could be employed by industrial plants and public health personnel to check on the quality of plant effluents.

Study to be extended to oxidation ponds in 1969-70.

SUPPORTED BY University of Texas

1.0164, STABILIZATION STUDY OF FALCON RESERVOIR

C.R. COOKE, State Parks & Wildlife Dept., *Austin, Texas* 78701

Objective: To determine the effects of a stabilized water level, created by an upstream reservoir, on stratification, fish populations, sport fishing, food forms, and water quality of Falcon Reservoir.

Procedures: A. Stratification: An investigation will be made to determine if the lake stratifies, to locate strata zones, and to measure any changes that result from stabilization. B. Fish Populations: A study will be made of existing fish populations to determine composition, relative abundance, and distribution. C. Sport Fishing: A study will be made of species and season, and of methods which might improve lake utilization. D. Food Forms: Plankton and bottom organisms will be studied. E. Water Quality: Chemical analyses will be made bimonthly at five shoreline stations for dissolved oxygen, carbon dioxide, alkalinity, and pH. Water and air temperatures and turbidity readings will also be recorded at each station. F. Water Level: Weekly records will be kept of the water level and volume of the lake. These data will be compared with past records to note changes which occur.

This study is being conducted on Falcon Reservoir, Zapata County, Zapata Texas.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0165, SELECTIVE WITHDRAWAL AT LAKE LIVINGSTON

E.G. FRUH, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

The overall goal of this project is to evaluate the significance of selective withdrawal as a tool in the water quality management program for impoundments.

Impoundments at Livingston of the relatively rich organic and inorganic nutrient laden Trinity River will bring about a marked variation in water quality with depth. Lake Livingston fortunately is one of the few impoundments in Texas having an outlet works that provides a means for selecting release water from various depths. By releasing different strata of water through the dam's variable depth outlets, the quality of water desired both for Houston's supply and for the freshwater input to Galveston Bay can perhaps be met.

To fulfill this goal, field and office investigations will determine the limnologically significant water quality parameters of the Trinity River at and above Livingston before and while the impoundment fills. At the same time, laboratory investigations on two types of 'pilot impoundment units' will be conducted to predict water quality changes for simulated reservoir conditions. Following impoundment filling, field studies will determine the water quality of the impoundment and its releases. These data will be useful in evlauating the water quality changes predicted through use of the 'pilot impoundment units.' Furthermore, from such field data an experimental operating program can be organized for the following year to evaluate this use of selective withdrawal as a water quality management tool.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0166, COMPUTER MAPPING OF TEXAS OUTDOOR RECREATION INVENTORY DATA

C.S. VANDOREN, Texas A & M University System, School of Agriculture, *College Station, Texas* 77843

Selected outdoor recreation enterprise data is being mapped by computer (SYMAP) on a statewide basis as well as selected Standard Metropolitan Statistical Areas. The contract includes research methods for displaying activity demands as well as the supply of facilities and resources in the most efficient manner.

SUPPORTED BY Texas State Government

1.0167, ANCILLARY SERVICE FACILITIES ON THE ASIAN HIGHWAY

GRUOT, Asian Highway Project, *Bangkok, Thailand*

A survey is being made of the present condition of services along the Asian highway such as hotels and motels, filling stations and repair shops, health services, telecommunications, highway police, and frontier formalities. Improvements needed in relation to the expected development of traffic and tourism are being reported. Recommendations will be made on international and national organization to improve these services, and on methods of assessing future international traffic. It is also recommended that a social-psychological survey of tourism in Asia be undertaken.

SUPPORTED BY French Government

1.0168, COOPERATIVE FOREST RECREATION RESEARCH UTAH STATE UNIVERSITY

P.A. BARKER, Utah State University, U.S.D.A. Intermtn. For. Sta., *Logan, Utah* 84321

Objective: To stimulate and guide graduate study and research in forest recreation and develop techniques for planning, development, and management of wild lands in the Intermountain West for recreational use.

Approach: The Project Leader acts as advisor for programs of graduate study in several areas related to outdoor recreation. Research by the Project Leader seeks ways to maintain and improve heavily used recreation sites.

Progress: Forty-eight pairs of plots at different locations on the Cache National Forest were treated for the third season of a study period planned to span 4 years. At each location, both plots were seeded to grass and legumes and were trampled once each week to simulate recreational use. Each week, after trampling, one plot was watered. At Sunrise Campground, also on the Cache National Forest, a number of plots, each of which includes an entire family unit, was watered for the sixth consecutive season. Besides watering, fertilization and seeding to grass (as well as combinations of all three treatments) are being tested for maintaining and improving ground-cover vegetation in the campground. Results of these studies should provide an index to site durability under different kinds of management. They will also provide guidelines for selecting new sites for recreational development, based on predicted natural durability under recreational use.

SUPPORTED BY U.S. Dept. of Agriculture

1.0169, EUTROPHICATION OF SHELTERED BAYS IN A LARGE LAKE

W.T. HELM, Utah State University, Graduate School, *Logan, Utah* 84321

Bear Lake at the present time is a clear oligotrophic lake. With the recent increase in recreational use of the area, however, a number of boat harbors and breakwaters have been constructed. These structures have interrupted the normal shoreline currents. Along unprotected shores, the currents scour the bottom, limiting the amount and diversity of rooted vegetation and bottom organisms. Modification of this habitat by creating relatively quiet pockets protected from the wind driven water currents has encouraged the growth of a wide variety of organisms. The non-turbulent circulation pattern in these areas insures the retention of at least part of any intruding nutrient-rich water. The reactions of the rooted vegetation, phytoplankton, zooplankton, and possibly fish to this altered environment will logically provide a preview of the changes to be expected throughout the lake if overall nutrient levels are allowed to increase.

The study will be initiated by locating a series of comparable bays. The water chemistry of these bays will be compared with each other and with the lake water. Complete records of chemical and physical conditions during the study will be kept. Biological sampling will determine the abundance and speciation of periphyton, plankton, bottom organisms, and rooted aquatic plants. Samples from the open lake and from non-enriched bays will be compared to those from enriched bays to determine changes caused by enrichment. In this fashion, both quantitative and qualitative changes can be measured and evaluated.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0170, PLANNING AND DEVELOPMENT OF RECREATION USE AND THE MANAGEMENT AND REHABILITATION OF RECREATION AREAS

R.B. HERRINGTON, U.S. Dept. of Agriculture, Intermtn. For. & Rg. Exp. Sta., *Ogden, Utah* (INT1901)

OBJECTIVE: Identify, measure, and evaluate the recreation potential of forest land; establish criteria to plan recreation in a multiple-use complex; and determine the impacts of recreation use and management measures required to maintain or restore heavily used recreation areas.

APPROACH: Techniques are being tested to control, restrict, and guide human movement within camp and picnic areas and extensive areas in order to devise ways to keep people from destroying the more fragile aspects of any recreation site. Site potentials will be evaluated and site improvement techniques will be tested, and these will be tested with alternative management measures; and the use and potential of public and private recreation developments in the Western States will be evaluated.

PROGRESS: The campground vegetation rehabilitation study at Redfish Lake, Idaho, has yielded very encouraging results at the end of the second growing season. Plots receiving water, fertilizer, and seed (grass and clover) had 49 percent grass, shrub, and herb cover at the end of the second season of growth and treatment. Water and seed only produced 29 percent; fertilizer and seed resulted in 17 percent; and plots receiving only seed had 7 percent. Plots are 85 feet square and contain one family unit. From an administrative point of view, however, it is apparent that the public will accept the once-a-week campground closure needed to water the campground.

SUPPORTED BY U.S. Dept. of Agriculture

1.0171, FOREST ECOSYSTEM MANAGEMENT AND PROTECTION NORTHERN ROCKY MOUNTAIN AND INTERMOUNTAIN REGIONS

A.L. ROE, U.S. Dept. of Agriculture, Intermtn. For. & Rg. Exp. Sta., *Ogden, Utah* (INT1205)

OBJECTIVE: Develop comprehensive ecological framework for the establishment, development, and maintenance of forest ecosystems and to provide guides for critical problems now faced by land administrators in multiple use management.

APPROACH: Investigate: (1) silvicultural systems for management of lodgepole pine forest associations in light multiple use requirements for timber production, watershed protection, aesthetic and recreational needs, and wildlife habitat; (2) silvicultural systems to produce and maintain aesthetically pleasing landscapes in major forest types of the region; (3) multiple use silviculture for water and travel influence zones in major forest types of the region; and (4) silvicultural systems for aspen forest types to satisfy multiple use requirements.

PROGRESS: Difficulty in reproducing Engelmann spruce forests by natural means has created serious problems for forest managers, particularly in the central [illegible] southern Rocky Mountain spruce-fir forests. The problem was so widespread that foresters reduced the spruce cut in the Intermountain forests pending the receipt of more information on how to reproduce spruce stands. Preliminary guides recently developed in cooperation with the Rocky Mountain Station and Region 2 of the Forest Service summarize and integrate information found in the literature, results from regeneration surveys in the Intermountain and the Rocky Mountain Region forests, and draw upon available research results and applicable experience. They present some of the principle environmental factors that influence the probability of seedling initiation and survival. They also point out that stocking of cutover spruce stands may be developed in one of two ways. First, by evaluating the management potential of advance reproduction and cultivating it; and secondly, by inducing subsequent restocking by natural or artificial means when the advance reproduction is lacking or not worth managing. Several courses of action from which the manager may choose are discussed. These guides, though broad and somewhat general, supply the basis for developing localized specific management guides.

SUPPORTED BY U.S. Dept. of Agriculture

1.0172, IMPACT OF AIR POLLUTANTS ON ECOSYSTEMS

K.T. HARPER, Univ. of Utah, Graduate School, *Salt Lake City, Utah* 84112

The primary research objective of this study is to determine the impact which air pollutants have now or may have in the future on four natural ecosystems important to the Salt Lake Valley for watershed protection and/or recreation. Current levels of photochemical pollutants in air sheds over the selected ecosystems will be monitored by means of sensitive plant indicators and standard analytical devices. Effects of pollutants on growth and reproductive processes of dominant plants of each ecosystem will be determined from fumigation trials conducted under growth chamber, greenhouse and field conditions.

Dominant plants (those plants that would most alter the ecosystem if they were eliminated) will be identified by means of modern, quantitative ecological measurements of many stands in each of the ecosystems selected. Environmental data will be taken at each stand to determine the range of site variation within each ecosystem and response of individual species to that variation. Permanent study plots encompassing the range in variation in each ecosystem will be selected for further observation and study. Changes in community composition and successional trends following field fumigations will be documented.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - P.H.S.

1.0173, EDUCATION IN OUTDOOR RECREATION DEVELOPMENT

J.J. LINDSAY, Univ. of Vermont, University Extension Service, *Burlington, Vermont* 05401

A pilot project was undertaken to study methods by which the State Extension Services could create programs to service the demand for education in the field of private income producing outdoor recreation on rural lands. Revision or adaptation of familiar techniques to the Extension Service was recommended in addition to new techniques that seemed applicable to the problem. The pilot study was carried out in the State of Vermont and some findings were peculiar to that region. However many suggestions resulting from the project have universal application throughout the United States.

SUPPORTED BY University of Vermont

1.0174, A STUDY OF THE LAKE CHAMPLAIN WALLEYE

J.K. ANDERSON, State Fish & Game Department, *Montpelier, Vermont* 05602

Objectives: To locate and define the various walleye populations in Lake Champlain; to determine the movement of walleye fry of the Missisquoi Bay and river spawning populations.

Procedures: The study of the Lake Champlain walleye will be divided into two phases. The first phase will be to locate and determine the ranges of the various walleye populations. The walleyes will be collected and tagged during their spring spawning runs in the Lamoille River, the Winooski River, Otter Creek, and potential shoreline spawning sites. Electro-fishing gear and an otter trawl will be used to capture the adult walleyes. Tag returns from anglers and lake studies will be used to locate the ranges of each population.

The second phase will be a fry movement study. These studies will be confined to the Missisquoi Bay and River. Spawning sites will be determined through egg collections. Fry will be netted with traps and trawls to follow their movement back to the main lake. An attempt will be made to evaluate critical factors affecting fry survival.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0175, AN EVALUATION OF THE LAMPREY IN LAKE CHAMPLAIN

J.K. ANDERSON, State Fish & Game Department, *Montpelier, Vermont* 05602

Objectives: To locate the principal spawning streams of the lamprey. To determine the extent of their predation upon fish in Lake Champlain and to determine fishes most readily attacked.

Procedures: Spawning streams will be located utilizing electro- fishing gear to sample adults and to locate ammocoetes. These streams will be catalogued with reference to spawning locations and the approximate size of the lamprey population utilizing it as a spawning site.

All fish collected in Lake Champlain studies will be examined for lamprey scars and records kept of such scars. These records will be used to evaluate the lamprey predation upon each species of fish and to determine the susceptibility of each species to lamprey predation.

A reporting card for lamprey scars on fish taken by anglers has been designed and distributed to Law Enforcement officers and interested persons to aid in gathering of records of incidence of lamprey scars observed by fishermen.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0176, CHEMICAL AND PHYSICAL CHARACTERISTICS OF LAKES, PONDS AND STREAMS IN VERMONT

J.K. ANDERSON, State Fish & Game Department, *Montpelier, Vermont* 05602

Objectives: To determine the physical and chemical characteristics of lakes, ponds and streams in Vermont.

Procedures: Sample sites will be selected on each lake. Basic water quality collected at each sample site will be as follows: water temperature, dissolved oxygen, hydrogen-ion, and alkalinity.

Aquatic plants will be identified and the extent of their coverage determined.

Ecological conditions in and adjacent to each body of water will be investigated, evaluated and reported upon, to include a study of the vegetation necessary for cover, spawning sites and nursery areas; also to include similar evaluation of shore-line spawning facilities, inlets and similar features.

Other physical characteristics of the pond or lake such as size, volume, outlets, inlets, etc. will be determined or located. A map will be prepared consisting of five or ten foot contour lines and indicating or listing the physical characteristics of that body of water.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0177, CREEL SURVEY

J.K. ANDERSON, State Fish & Game Department, *Montpelier, Vermont* 05602

Objectives: To estimate the harvest at the lakes, ponds and streams in Vermont in terms of catch per unit of effort and species composition.

Procedures: Creel survey data will be collected by the following methods: 1) a voluntary basis by providing data sheets at launching sites. These forms will be filled out by fishermen at the completion of each trip. 2) Voluntary survey booklets given to reliable fishermen to complete at the end of each trip; and 3) a systematic survey conducted by department personnel.

The method selected will be that which is most suitable for the body of water in question, and will vary according to the physical characteristics, the species composition, and data desired.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0178, A NEW LOOK AT THE OCEAN RECREATION MARKET

A.B. BIGLER, Compass Publications Inc., *Arlington, Virginia* 22209

The major problems in deficiency of shoreline recreation opportunities are discussed. These include (1) limited supply of prime beach and other shoreline recreation area, (2) discrepancy in available prime recreation shoreline with population location, (3) competition of other shoreline uses, and (4) effects of pollution and accelerated natural and man-made erosive forces. Various applications of marine science and technology are discussed for enhancing shoreline and near- shore recreation opportunities, including modification of shoreline configuration, development of offshore islands and platforms, preservation and enhancement of underwater areas, and artificial means of controlling waves and currents.

SUPPORTED BY No Formal Support Reported

1.0179, IDENTIFYING ENVIRONMENTAL QUALITY ATTRIBUTES IN WATER RESOURCES

R.E. VINCENT, U.S. Natl. Water Commission, *Arlington, Virginia* 22203

The overall objectve of the study is to provide information on the effects--both adverse and favorable--of water resource development upon the environment, including its impacts upon scenic beauty, historic and wild areas, fish and wildlife resources and recreational opportunities, and to develop means for weighing such effects against possible material gains. The study has been divided into four parts: (a) the role of environmental quality in maintaining a balance of values in water development; (b) the role and aesthetic value of water in landscape design; (c) the classification and designation of water for specific uses; and (d) recycling and ecosystem response to water manipulation. Each of these parts represents a discrete research task to be accomplished separately under contract. The overall study will evaluate and synthesize the results of the contract studies.

SUPPORTED BY U.S. National Wtr. Comm. - Arlington, Va

1.0180, GREENHOUSE AND FIELD USE OF PLASTICS IN HORTICULTURAL CROP PRODUCTION

M. MARSHALL, Virginia Polytechnic Institute, School of Agriculture, ***Blacksburg, Virginia*** 24061

In recent years there has been a rapid shift from glass to glass- substitue greenhouses; especially to plastic covered greenhouses. Through design research & testing at VPI, attractive wood frameworks for plastic covered greenhouses have been developed. Heating & ventilation systems have been designed and developed which allow these low cost facilities to perform equally as well as glass greenhouses.

Plans are available for large commercial size plastic greenhouses and also for 'hobby size' Gothic shaped plastic covered greenhouses. The 'hobby size' plastic greenhouse measures 12' X 15', and plans and specifications are provided in VPI Circular 892. Building this greenhouse is a do-it-yourself project designed for recreation; the use of the plastic greenhouse should provide many hours of recreational activity as well for those families interested in growing plants, vegetables, and flowers. Many ideas have been proposed for all kinds of usages of this greenhouse framework. It might be used for a tool house, small car garage, to cover a sand box, or to erect at the lake-shore for living quarters outdoors.

This research project has been in progress for several years and has recently been revised to cover also the use of plastic film to establish modified micro-climate conditions for growing plants.

SUPPORTED BY Virginia State Government

1.0181, SHORELINE INVESTIGATIONS WITHIN THE CAPE HATTERAS NATIONAL SEASHORE

R. DOLAN, Coastal Research Associates, *Charlottesville, Virginia* 22903

This research is designed to answer questions concerning the magnitude, variation, and predictability of the processes responsible for shoreline dynamics within the Cape Hatteras National Seashore Area. Specifically, the major topics of investigation are (1) establishment of shoreline trends (historical) and monitoring of continuing changes, (2) the behavior of beach nourishment, and (3) general investigation of shoreline processes. The most important progress to date includes: 1. The role of sand wave migration in shoreline dynamics and engineering planning. 2. The historical, seasonal, and short-term trends in shoreline variation near Cape Hatteras. 3. Relationships between rates of shoreline recession and beach sediment characteristics. 4. And, documentation of the frequency and magnitude of destructive extra- tropical storms ('northeasters'), including investigations of wave forces and storm surges within the North Carolina sounds. 5. Scheduled for completion in 1971; Interim reports are available.

SUPPORTED BY U.S. Dept. of Interior - Natl. Park Serv.

1.0182, ESTIMATION OF PARAMETERS OF STRIPED BASS POPULATIONS AND DESCRIPTION OF THE FISHERY OF LOWER CHESAPEAKE BAY

E.B. JOSEPH, Virginia Inst. of Marine Sci., *Gloucester Point, Virginia* 23062

Objective 1. To obtain an estimate of age composition of the striped bass stocks in lower Chesapeake Bay.

Objective 2. To determine the age selectivity of major types of fishing gear.

Objective 3. To measure the proportion of total catch taken by each type of fishing gear, and to estimate the magnitude of the recreational catch.

Objective 4. To estimate mortality rates for striped bass during their resident phase.

Objective 5. To estimate abundance of individual year classes.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0183, BAND-TAILED PIGEON RESEARCH

C.V. SWANSON, State Dept. of Game, *Olympia, Washington* 98501

A study of the band-tailed pigeon, with emphasis on those ecological factors which are associated with, or affected by, recreational sports hunting. It is anticipated that a greater utilization may be accomplished without any jeopardy to the species. A better knowledge of the basic ecology of the birds is needed for game management purposes.

These studies will include food habits, reproductive rates, crop glandularity, nesting, etc. 'Perch-call' routes will be established randomly throughout the bandtail range of Washington. These routes will be run regularly, and it is hoped they will prove effective as a census technique. A wing-collection survey will be started as an aid in determining the status of the population size and the effects of hunting on the population. Food habits will include crop analyses plus visual observations. Crops will be taken, largely throughout the hunting season and from incidental collections. Crop glandularity studies of birds collected during the hunting season, will give a measure of the breeding population size and will be of immeasurable value for management purposes.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0184, THE PREDICTION OF WATER QUALITY ASPECTS OF THE WENATCHEE RIVER

H.D. COPP, Washington State University, School of Engineering, *Pullman, Washington* 99163

A pumped-storage hydroelectric power development has been proposed by the Sponsor on the Wenatchee River, a mountain stream in north central Washington State. Since this river is an important fish spawning stream, tributary to the Columbia River, and since recreation activity is increasing in the watershed, influences of the proposed power project on existing water quality need to be predicted.

Simulation techniques by digital computer are being developed for prediction purposes. Weather phenomena, system hydrology, heat transfer, principles and mixing processes have been programmed for both reservoir and stream waters to compute temperatures and oxygen and nitrogen contents in these waters. A program is operable and is quite general, i.e., it is not tied to the system under consideration.

SUPPORTED BY Chelan County Government - Washington

1.0185, A GLOSSARY OF RECREATION TERMS

J.A. TORNEY, Univ. of Washington, Graduate School, *Seattle, Washington* 98105

The purpose of the project is to seek the agreement of professional recreators and physical educators upon definitions of recreation terms.

The sub-problems are: 1. To establish the terms to be defined. 2. To arrive at acceptable definitions of the selected terms.

The method of obtaining data for the solution of the first sub-problem has been by the tabulation of terms appearing in newspapers of the selected State of Washington, researching of publications of the Bureau of Outdoor Recreation. A list of the terms has been compiled and submitted to selected recreators and physical educators to obtain recommendations for inclusion or exclusion in the proposed glossary.

Solution of the second sub-problem will be undertaken when the list of terms is refined. To a reproduction of the definitions appearing in the 'Glossary of Recreation Terms' compiled by the North Carolina Recreation Commission will be added other options in definitions.

The present intent is to submit the definition options to a selected panel of experts for acceptance, proposals for modification or rejection.

SUPPORTED BY Washington State Government

1.0186, LANDOWNER SURVEY

J.E. RIFFE, State Div. of Wildlife Resour., *Charleston, West Virginia* 25305

Job Objectives: 1. To obtain an estimate of the percentage of private lands available for public hunting and fishing. 2. To determine landowners' attitudes toward use of their lands for public hunting and fishing. 3. To determine landowners attitudes toward charging fees for hunting and fishing on their lands. 4. To determine land use patterns affecting the State's wildlife resources.

Procedures: 1. A random sample of landowners in each county, stratified by acreage owned and location in regard to population centers, will be drawn from county deed records. 2. Name, address and identification number will be punched onto digital computer cards. 3. Questionnaires will be designed and printed on continuous form computer paper. These questionnaires will be addressed at West Virginia University Computer Center. 4. Questionnaire, cover letter and pre- paid reply envelope will be mailed to sample landowners. Second and third mailings will follow at approximately 10 day intervals to nonrespondents. 5. Responses will be edited. 6. Identification number, mailing number (first, second, or third) and other information from questionnaire will be punched onto digital computer cards. 7. Tabulations, extrapolations, and statistical analysis will be done at West Virginia University Computer Center. 8. Results will be tabulated by county and Statewide.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

1.0187, MANIPULATION OF RESERVOIR WATER FOR IMPROVED QUALITY AND FISH POPULATION RESPONSE

T.L. WIRTH, State Dept. of Nat. Resources, *Madison, Wisconsin* 53701

The number of small recreation reservoirs (50-200 acres) in Wisconsin's lakeless region is rapidly increasing. The formation of these impoundments alters the downstream channel while the fertility of the region causes the reservoirs to become highly eutrophic with limited aesthetic value due to aquatic nuisances. Recreational angling in the reservoirs appears to be depressed due mainly to intense algal growths and adverse aquatic environments (anerobic hypolimnion) which limit fish production in the steep-sided basins. Different management techniques are being applied to two in-line reservoirs. The downstream impoundment, which first filled in May 1967, is equipped with an outlet structure which continuously discharges hypolimnion water.

The upstream impoundment discharges epilimnion water and is being continually mixed to prevent thermal stratification. Quantity and quality (temperature, pH, D. O., transparency, major nutrients, and elements) of the inflow, and impounded waters are being measured throughout the year. Fish production and harvest are measured through techniques of population estimates, growth rates, age distribution, and angler's catch for comparison to previously measured levels. Invertebrate species composition and relative abundance are being measured in both of the impoundments and in the stream below the lower reservoir to ascertain changes brought about by manipulation. Aquatic vegetation changes are also being noted in the stream below.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0188, CHANGES IN WATER ENVIRONMENT RESULTING FROM AQUATIC PLANT CONTROL

G. COTTAM, Univ. of Wisconsin, Graduate School, *Madison, Wisconsin*

The effect of harvesting aquatic macrophytes was studied over a three year period by means of two plots, each 30 m by 30 m located in University Bay on Lake Mendota, Wisconsin. The plots were subdivided into nine compartments and were treated as follows: 1) Harvested 3 times, in June, July, and August. 2) Harvested twice, a) in June and July, b) in July and August. 3) Harvested once, a) in June, b) in July, c) in August. These plots, and their controls, were sampled four times, in June, July, August, and September. Sampling was done with SCUBA apparatus. The plants were cut six inches (15 cm.) above the bottom surface and were weighed and measured. The results indicate that one harvesting will reduce the amount of regrowth to about 50 per cent of that of the controls, two harvests will result in about 75 per cent reduction, and three harvests almost totally eliminated the plants for that year. Recommendations for harvesting heavily used areas are two harvests, one in mid June, and the other in July. August harvesting is not necessary in this climate, since the plants tend to break up regardless of treatment. None of the treatments had an appreciable effect on the subsequent years growth, even after two years of harvesting three times.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

1.0189, PROPOSAL FOR SUPPORT OF COMMUNITY SERVICE PROJECT UNDER TITLE I OF HIGHER EDUCATION ACT 1965, WISCONSIN STATE UNIVERSITY-RIVER FALLS

A.J. BEAVER, Wisc. State University, School of Agriculture, *River Falls, Wisconsin* 54022

This project will demonstrate how the staff and student resources of a small university can help the local community design a plan for the proper development and control of a valued natural resource. The program will enable the staff of Wisconsin State University - River Falls to obtain information, establish working relationships and gain experience in providing professional community service.

This project will also lead to the development of an outdoor recreational area, an educational field laboratory and a scientific area in northwestern Wisconsin available for workshops, field trips and research for elementary through university students and adults interested in conservation, and nature studies, outdoor recreational land area development and land use planning.

SUPPORTED BY Wisconsin State University

1.0190, CHANGE OF PLANT COVER IN CAMPGROUNDS - SELECTION AND EVALUATION OF DURABLE PLANTS

A.C. EPPS, U.S. Dept. of Interior, National Park Service, *Yellowstone National Park, Wyoming* 82190

No summary has been provided to the Science Information Exchange.

SUPPORTED BY U.S. Dept. of Interior - Natl. Park Serv.

1.0191, TO INVESTIGATE THE EFFECTIVENESS OF A PLANNED SPORTS PROGRAM AS AN INTEGRAL PART OF THE REHABILITATION PROCESS

Z. ZEC, Special Orthopedic Hospital, *Belgrade, Yugoslavia*

No summary has been provided to the Science Information Exchange.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - V.R.A.

1.0192, WINTER TOURISM IN YUGOSLAVIA

A. ZOR, Urbanistic Inst. S.R. Slovenia, *Ljubljana, Yugoslavia*

Problem: Investigate natural conditions and the market for further development and planning of winter tourism in Yugoslavia.

Method: In addition to standard research and analysis, the investigators will compare data for Yugoslavia with that of other countries.

Document provided by Highway Research Information Service.

SUPPORTED BY No Formal Support Reported

DESCRIPTION OF RESEARCH TASKS

2. ECONOMICS

Cost and Return From Production, Distribution and Consumption of Outdoor Recreation

2.0001, COMPREHENSIVE STATE OUTDOOR RECREATION PLAN

J.H. BLACKSTONE, Auburn University, Agricultural Experiment Sta., *Auburn, Alabama* 36830 (ALA-01-0037)

OBJECTIVE: Update interim State outdoor recreation plan and to develop comprehensive outdoor recreation plan that involves an inventory of recreation areas and facilities, estimation of demand, developing standards, determining needs, providing for coordination of recreation resource use, and recommending a plan of action.

APPROACH: Inventory data on supply of recreational facilities will be completed on a county basis. Demand factors will be used to estimate future demand for 1980 and 2000. Standards will be developed to insure quality of recreation and to be economically feasible under present and expected future financing capabilities of Alabama. Means of coordination of groups and legislative needs will be recommended.

PROGRESS: Considerable data were gathered for use in the comprehensive recreation plan. The total plan will probably be developed in five reports. The first report, Environmental Resources for Recreation in Alabama, is in manuscript form. A first draft of the second report, Present and Projected Demand for Recreation, is largely completed. Considerable research and writing have been done on Needed Legislation for Recreation - the third report. The fourth report, Existing Recreation Sites, will be developed as soon as the inventory is completed. The fifth report will be Plan of Action. Alabama has an extensive resource base which makes it possible to develop a wide variety of park types. The State has been divided into 4 major planning regions and 13 districts. It is recommended that a major recreation complex be developed as State parks in each of the regions. The State has had master plans developed on three of the four regional sites recommended. Master plans are being developed in 11 of the 13 recommended districts and for the remaining regional park. Funds for developing State parks are available from a 43 million dollar bond issue. Existing legislation dealing with recreation in the State has been inventoried through a review of the Alabama Code. This shows the legislation has been passed only when a serious problem has developed. Recommendations are being made that will provide for legislation that will be forward looking and provide development guidance.

SUPPORTED BY Alabama State Government

2.0002, WATER QUALITY REQUIREMENTS IN ALASKA CAMPGROUNDS WITH PROJECTIONS OF RECREATION DEMANDS AND BENEFIT/COST ANALYSIS FOR SITE SELECTION

R.S. MURPHY, Univ. of Alaska, School of Engineering, *College, Alaska* 99735

Alaska's outdoor recreation resources represent a major income producing sector of the State. To a large extent its further growth appears restricted by insufficient and inadequate campgrounds. Existing camping facilities have not been examined thoroughly in terms of water quality problems, and the role of water in benefit/cost analysis in evaluating recreation in Alaska barely has been touched. The product of the study would provide important information which would aid directly in the programming of new recreation sites.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

2.0003, BEAVER CREEK PILOT WATERSHED EVALUATION PROJECT

H.E. BROWN, U.S. Dept. of Agriculture, Rocky Mtn. For. & Rg. Ex. Sta., *Flagstaff, Arizona* 86001 (RM4201)

OBJECTIVE: To measure effects of land management practices on water yields, erosion and sedimentation, timber, forage, wildlife, and recreation, and to develop other physical-biological data for economic analyses of practices.

APPROACH: The research has three stages: a series of inventories and pretreatment studies, pilot testing of individual treatments on small, calibrated watersheds, and pilot testing of combinations of promising treatments in a management program on large, calibrated watersheds. Evaluations involve measuring treatment effects on water yields and yields of other multiple uses and products.

PROGRESS: Preliminary results from small watershed tests indicate that there are modest gains in cattle forage following cabling of Utah juniper and felling of alligator juniper, but these gains are offset by a complete loss of wood production. Water and sediment production appear to be unchanged, and wildlife effects are uncertain. In the ponderosa pine type, a range of tests was started with a clearcutting treatment. There have been substantial gains in water production and in forage for cattle and wildlife following this treatment, but in exchange there was a total loss of wood production, a loss in aesthetic value, and an increase in sediment yield. A more refined pine treatment, where one-third of a watershed was cleared in regular 60-foot strips, has been completed for 1 year. So far, there are indications of increased water, herbage, and wildlife yields, but there have been some losses in wood production and aesthetic value as well as a slight increase in sediment yield.

SUPPORTED BY U.S. Dept. of Agriculture

2.0004, THE RECREATIONAL VALUE OF A SMALL RESERVOIR IN AN ARID ENVIRONMENT

D.A. KING, Univ. of Arizona, School of Agriculture, *Tucson, Arizona* 85721

The objective of the research is to measure the recreational value of Pena Blanca Lake, a small recreational reservoir in southern Arizona. The addition of recreation values to consumptive use values of such reservoirs could make them economically justifiable. Surface run-off water utilization would reduce groundwater overdrafts.

The willingness-to-pay valuation approach will be used via personal interviews of a sample of visitors. An attempt will be made to obtain quantity responses at the various levels of the hypothetical fee. Data will be gathered on demand shifters such as income, education, age, and distance traveled.

Demand curves will be derived within income classes and then aggregated. The consumer's surplus will be calculated as a measure of gross benefits. Investment costs and operating costs will be subtracted to arrive at a net benefit for the area.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

2.0005, AN ECONOMIC STUDY OF THE DEMAND FOR OUTDOOR RECREATION

D.A. KING, Univ. of Arizona, Agricultural Experiment Sta., *Tucson, Arizona* 85721 (ARZT-9010-240-640)

OBJECTIVE: Develop methods for valuing motorboat use of Arizona reservoirs. Estimate demand for and value of motorboat use. Derive cross-elasticities of demand between reservoirs.

APPROACH: An examination of existing demand theory for its applicabilities to motorboating will be made. A mail survey will be used to obtain data on quantity of use, participation costs, and socio- economic characteristics of motorboat owners. Factor analysis and multiple regression analysis will be used.

PROGRESS: In February, a mail questionnaire was sent to a random sample of 2000 owners of motorboats registered in Arizona. Data requested included: socioeconomic charactersitics; cost and type of equipment, and expected motorboating activity between April 1 and September 31, 1967 by reservoir. Useable responses were received from 969 owners. These owners were then sent a cost booklet in which to record additional fixed costs incurred, cost of each trip, and destination of each trip taken during the season. Of these, 969 owners, 230 returned the cost booklets. The data will be used to estimate motorboating functions for each reservoir, cross-elasticities among reservoirs, and the value of the reservoirs for motorboating. The data is now being collected.

SUPPORTED BY U.S. Dept. of Agriculture

2.0006, STUDY OF ECONOMIC FEASIBILITY OF RECREATIONAL & TOURIST SERVING FACILITIES AT THE FOUR CORNERS

G.F. LEAMING, Univ. of Arizona, School of Business Admin., *Tucson, Arizona* 85721

The investigator is studying the economic impact of various National Parks, Monuments and Historic Sites in the vicinity of the Four Corners Region of the states of Arizona, Colorado, New Mexico and Utah.

SUPPORTED BY U.S. Dept. of Interior - Natl. Park Serv.

2.0007, SYSTEMS ANALYSIS OF WINTER SPORTS SITE UTILIZATION

G.H. ELSNER, U.S. Dept. of Agriculture, Pac. Sw. For. & Rg. Expt. Sta., *Berkeley, California*

To develop an initial management simulator useful in exploring the effects of alternative decisions upon winter sports site utilization on Federal lands in California.

SUPPORTED BY U.S. Dept. of Agriculture

2.0008, NONLINEAR CAMPING USE-AXLE COUNT FUNCTION STUDY

G.H. ELSNER, U.S. Dept. of Agriculture, Pac. Sw. For. & Rg. Expt. Sta., *Berkeley, California*

To define the expected mathematical properties of camping use-axle count functions, formulate a function that satisfies these properties, and describe the method of estimation.

SUPPORTED BY U.S. Dept. of Agriculture

2.0009, CAMPGROUND EXPANSION BUDGET ALLOCATION MODEL

G.H. ELSNER, U.S. Dept. of Agriculture, Pac. Sw. For. & Rg. Expt. Sta., *Berkeley, California*

To develop a formal model for allocating campground expansion monies.

SUPPORTED BY U.S. Dept. of Agriculture

2.0010, ECONOMICS OF FIRE PROTECTION; AES PROJECT 01823

J.A. ZIVNUSKA, Univ. of California, School of Forestry, *Berkeley, California* 94720

Objective: To apply the techniques of operations research to certain allocation problems arising from the efforts of the California Division of Forestry in wildfire control; to develop a general model applicable to a variety of such problems; to apply the model to obtain an efficient solution to the problem of air tanker distribution within the state of California.

Technique: A general linear model utilizing aspects of transportation and work allocation linear programs has been developed and applied to large amounts of wildfire distribution data. The objective function of this model considers fire retardant effectiveness as well as cost of delivery under the assumption of a probabilistic fire location distribution relative to available airbases.

SUPPORTED BY California State Government - Sacramento

2.0011, SOCIO-ECONOMIC STUDY OF MULTIPLE USE WATER SUPPLY RESERVOIRS

R. STONE, Ralph Stone & Company, *Los Angeles, California* 90025

The research objective is to determine and evaluate the social and economic costs and benefits associated with varying degrees of recreational use of water-supply reservoirs while maintaining safe potable water quality standards. Representative examples of four classes of reservoirs will be studied in depth to define the socio- economic cost-benefits of multi- versus single-purpose reservoir use to the community, region, and Nation, and the relationship of incremental water treatment requirements to the individual water consumer. The interrelationships between water quality standards, treatment costs, community recreation and water needs, alternative recreational reservoir use, economic activity generated, and projected pollution loads and demographic change will be defined to develop general principles for optimum water-supply reservoir management. Formulation of a DARE Algorithm, mathematical model, and computer program will ensure maximum applicability of the principles developed.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

2.0012, PLAN FORMULATION AND EVALUATION STUDIES - RECREATION DESIGN CRITERIA AND DEMAND

F. KINDEL, U.S. Army, Engineer District, *Sacramento, California* 95814

The project is composed of the following general study areas: Area I - Recreation Use Data Collection. Consists of (a) development of a reliable, consistent sample survey of recreational use at Corps of Engineers reservoir projects and (b) investigation of alternative methods of estimating actual visitation at Corps of Engineers civil works projects.

Area II - Data Analysis. Consists of (a) development of interim procedures for estimating future use at proposed reservoirs, using project characteristics and per capita visitation rates at existing reservoir projects; (b) development of use estimating equations and based on survey estimates of recreational use at existing reservoir projects, project characteristics, and socio-economic characteristics of reservoir market areas. (c) evaluation of the effect of competitive recreation sites on recreational use; and (d) development of improved means of estimating outdoor recreation benefits.

Area III - Planning Guidelines. Application of the results of Areas I and II to develop practical methods for planning recreational developments.

Area I-(a) is completed and the results published in Technical Report No. 1 - 'Evaluation of Recreation Use Survey Procedures.' Area II-(a) has been completed, and the results published in Technical Report No. 2 - 'Estimating Initial Reservoir Recreation Use.' Work is in progress on Areas II-(b), II-(d) and III. Interim results of work on Area II-(b) have been published in Contract Report No. 1 - 'Analysis of Recreational

Use of Selected Reservoirs in California,' by V.S. Pankey and W.E. Johnston.

SUPPORTED BY U.S. Dept. of Defense - Army

2.0013, ECONOMIC ANALYSIS OF WATER USE IN COLORADO'S ECONOMY

D.D. ROHDY, Colorado State University, Graduate School, *Fort Collins, Colorado* 80521

The proposed research involves an economic analysis of current water use and future allocation between specific sectors in Colorado's economy and related economies outside Colorado. Input-output and linear programming procedures will be used for the analysis.

The specific objectives are: 1. To determine the economic interrelationships among the major sectors of Colorado's economy. 2. To estimate future output of specific sectors and determine the impact of these output changes on all sectors of Colorado's economy. 3. To delineate the economic importance of water resources on major sectors of Colorado's economy. 4. To estimate the impact of future output levels on the demand for water and to examine possibilities for substitution between water and other factors in an optimizing framework.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

2.0014, ECONOMIC IMPACT OF HUNTING AND FISHING EXPENDITURES

D.D. ROHDY, Colorado State University, Graduate School, *Fort Collins, Colorado* 80521

Objective: Determine the net economic impact of hunting and fishing expenditures in Colorado.

Procedures: 1. The analytical model was theoretically formulated during 1967-68 and a decision was reached to use Grand County as the study area. Also, a questionnaire involving hunting and fishing expenditures was developed and pretested during 1967-68. 2. The expenditures questionnaire was used during 1968-69 to collect data from approximately 900 hunters and 350 fishermen who hunted and fished in Grand County during 1968. 3. A second questionnaire was developed and pretested during 1968-69 for the purpose of collecting information from business firms in Grand County. Data were collected from about 115 firms during June, 1969 with the business questionnaire. These primary data, plus available secondary data, will permit an estimation of the economic interrelationships between different sectors of Grand County's economy. 4. During 1969-70 the data collected during 1968- 69 will be used to determine the total (net) impact of hunting and fishing expenditures, by sector, on Grand County's economy. The study will terminate June 30, 1970.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

2.0015, ASSESSING BIG GAME MANAGEMENT ALTERNATIVES THROUGH BIOECONOMIC MODELS

H.W. STEINHOFF, Colorado State University, Agricultural Experiment Sta., *Fort Collins, Colorado* 80521 (COL00217)

OBJECTIVE: Develop, test, and refine models simulating existing relationships and values of resources related to big game production and use. Determine bio-economic relationships and values in big game production and use. Demonstrate application and related public policy decisions. Devise a bioeconomic model for values of big game to ranches of the Western Slope, Colorado, especially related to mule deer.

APPROACH: Data will come from county and state statistics, an interview with each rancher, and biologic data from a cooperative study underway with other public agencies. Will do 100% coverage in Grand County and sample of other western slope counties. Will test applicability of the model and the data by inserting a series of logical variations into the computerized model and noting whether predicted biological & economic results are reasonable.

PROGRESS: In November, 1967, a one page questionnaire regarding the previous big game hunting season and a letter of explanation were mailed to all ranchers in Grand County, Colorado who were interviewed during the summer of 1967. In January, 1968, a follow-up questionnaire was mailed to those ranchers who did not complete the first questionnaire. Following the second letter, a total of 90 ranchers (82%) had responded. During the summer of 1968, those ranchers who had not responded to either letter were personally contacted. In addition, ranchers who had not been interviewed during the previous summer, due to lack of experience at the ranch, were interviewed. Land ownership and value of all ranchers in Summit County were tabulated from county records. All 20 ranchers were individually interviewed. A list of Routt County ranchers was compiled from records of the county agent and from information supplied by Soil Conservation Service personnel. All 'dude' or guest ranchers and a ten percent random sample (30) of the 'working-type' ranchers were interviewed. An extensive literature review relating to big game values has been completed. Final analyses of data from Grand, Summit and Routt Counties and comparisons of the 1967 and 1968 Grand County data are now being made. These data will appear in a M.S. Thesis to be completed by June, 1969. A major achievement is anticipated in 4-6 months. This will be the thesis.

SUPPORTED BY U.S. Dept. of Agriculture

2.0016, AMENITY BENEFITS OF URBAN WATER RESOURCES

A.C. MOORE, Arthur C. Moore & Assoc. Arch., *Washington, District of Columbia* 20007

The proposed project will study social, esthetic and recreational benefits that could result from amenity use of urban waterfronts, reservoirs and estuaries; devise innovative approaches to water-related recreation and open space; identify recipients thereof; and introduce social, esthetic and recreational costs in economic analysis, evaluating amenity uses proposed in relation to their costs, thereby determining appropriate alternative objectives to economic efficiency in water policy.

Research would involve: 1) study of significant planned waterfront projects that did materialize; 2) those that did not materialize; 3) analyze new, water-related technology re development; 4) analyze sociological literature and ongoing research re water/people; 5) apply all research on amenity use plan of waterfront area of Washington, D.C.; 6) economic analysis, feasibility studies, Probable Construction Cost studies; 7) general engineering studies. Travel: San Francisco, San Antonio, and Chicago; Washington, D.C. riverfronts and reservoirs.

Proposed research would result in general direction with applicability to cities across the country re amenity use of water areas and economic parameters.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

2.0017, INTERRELATIONSHIPS AMONG OUTDOOR RECREATIONAL DEMANDS

J.L. KNETSCH, George Washington University, Ctr. For Nat. Resour. Pol. St., *Washington, District of Columbia* 20037

Outdoor recreation has become a major area of investment and consumption in America, encompassing a very wide range of activities, facilities, and resources. Recreation is not a single consumption commodity, but is a large group of interrelated commodities, much as food is comprised of many different items. The value of particular kinds of recreational opportunities will vary with such factors as their distance from the populations who will use them, the mobility of these recreationists, and other types of recreation available to them. Informed judgments about the interrelationships among different forms of outdoor recreation are required for effective policies and efficient investment programs. Little empirical information about such relationships exist at the present time. The proposed study would try to develop a technique for analyzing the way in which the demand for a particular form of recreation is affected by the availability of other types of recreational opportunities.

SUPPORTED BY Resources For The Future Inc. - Washington

2.0018, ALTERNATIVE MEANS OF ECONOMIC DEVELOPMENT OF RURAL AREAS

R.I. COLTRANE, U.S. Dept. of Agriculture, Economic Development Division, *Washington, District of Columbia* 20250 (ED9-4-54-00)

Objective: Evaluate for specific rural areas, including areas designated under the United States Department of Agriculture's rural development programs, a variety of public programs and determine alternatives for raising the level of economic development in rural areas and increasing the income of rural people.

Approach: Describe the current economic situation in terms of data available from Federal and State sources with respect to population, employment, income industry-mix, community facilities, and natural resources. Appraise prospects for economic growth in the areas by comparative analysis and structural analysis techniques pointing to industries, occupations, and other basic growth variables with estimates of impacts of changes in the basic growth variables on employment and income. Using results of the analysis, provide estimates of prospects for growth and suggest targets for public and private policies.

Progress: Studies were completed for the following areas: (1) the Ozark Gateway District in Missouri (Barton, Jasper, McDonald, and Newton Counties); and (2) the Iowa Rural Renewal Area (Appanoose and Monroe Counties).

SUPPORTED BY U.S. Dept. of Agriculture

2.0019, MAINTENANCE OF CURRENT INFORMATION OF CONTRACTUAL AGREEMENTS

G. WUNDERLICH, U.S. Dept. of Agriculture, Natural Resource Econ. Div., *Washington, District of Columbia* 20250 (NRE4-3-54-00)

OBJECTIVE: Assemble State, national, and international information on leasing and other contractual arrangements affecting land in rural areas.

APPROACH: Maintain the Department's publications on contractual arrangements for resource use, including leases for agricultural and for recreational purposes; and production agreements by updating the various recommendations therein, incorporating the results of new research, adding provisions for new developments in farm practices and marketing methods, and making other revisions in light of field experience in use of the material.

PROGRESS: Recording and storing information continued. No revisions in contract forms during FY 1967.

SUPPORTED BY U.S. Dept. of Agriculture

2.0020, SURVEY OF FISHERMEN AND CREEL CENSUS

H.M. SAKUDA, State Div. of Fish & Game, *Honolulu, Hawaii* 96813

Objectives: 1. To determine the fishing pressure and catch composition on the various islands in the State of Hawaii. 2. To determine the pattern of fishing in various localities. 3. To determine the variation of fishing pressure and catch between seasons within a year.

Procedure: The Department of Agricultural Economics, University of Hawaii has been subcontracted for a survey to determine the impact of recreational fishing on economic activity in Hawaii. The survey is designed in two phases: the first phase for data gathering and the second phase for analysis of data and preparation of the survey completion report. The first phase has been conducted between July 1, 1968 to June 30, 1969, and by amendment of the agreement the second phase will be conducted between July 1, 1969 to June 30, 1970. (A copy of the memorandum of agreement between the University of Hawaii and Department of Land and Natural Resources with the amendment to the agreement will be submitted as soon as possible).

Data that is being collected in this survey include information on the number of people that fish, their age and sex, the amount of time they spend fishing, numbers and types of fishes caught and dollars spent for fishing gear and other activities associated with fishing. The survey is designed to provide a measure of the recreational and economic value of the sportfishery in Hawaii primarily around the island of Oahu. Should opportunities present themselves, the survey will be expanded to include the neighboring islands, and survey methods will be modified if changes are deemed necessary.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

2.0021, DEVELOPMENT OF METHODOLOGY FOR EVALUATION OF WILD AND SCENIC RIVERS IN IDAHO

E.L. MICHALSON, Univ. of Idaho, Water Resources Research Inst., *Moscow, Idaho* 83843

Research centers around an inventory of present and future quantities of natural resources in the Salmon River drainage as a potential wild river area. A study would be made of the present and future values of esthetic resources, unique river experiences, unique ecological areas, and other social values. This would use a preference rating to develop a scale analysis for valuing these somewhat intangible aspects of the river environment. With these data a form of economic input-output analysis would be made and also a series recursive linear programming model would be developed to estimate present and future value under various degrees of development of the river. From this it is hoped to obtain a spectrum of alternatives from which to give policy makers a better base for making selections of wild rivers.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

2.0022, A STUDY OF THE TREND IN FOREST LAND EXCHANGE IN SOUTHERN ILLINOIS

R.M. MISCHON, Southern Illinois University, Graduate School, *Carbondale, Illinois* 62901 (ILLZ-69-R-B)

OBJECTIVE: Determine the magnitude of forest land exchange in seven So. Ill. counties in 1968. Investigate the socio-economic characteristics of recent buyers and their general purposes in purchasing forest land. Analyze differences in attitudes and opinions with regard to outdoor recreation development and forest management between recent land buyers and those owning land for more than 5, 10 and 20 years. Evaluate the impact of the trend in forest land exchange and the effect that it might have in the future in So. Ill. on outdoor recreation development and forest management.

APPROACH: A sample (or census, depending on the number) of recent property exchanges will be taken from each of the seven counties. These will include only land sales larger than 10 acres in size, with at least 3 acres of timber. The land sales will include land purchased during the calendar year 1968. These sales will be correlated with the County Assessment book and serial photos to determine the acres of improved and unimproved (forest) land. Each of the new land buyers included in this study will be sent a questionnaire with a cover letter explaining the purpose of the study. An addressed envelope, requiring no postage, will also be attached to each questionnaire. A second letter will be sent to landowners not replying within three weeks. It should take 15 to 20 minutes to complete the questionnaire. At least 20% (depending on the number) of the non-respondents will be randomly selected and interviewed to determine if their attitudes and opinions differ from those returning the questionnaire by mail.

PROGRESS: The data has been collected. It is presently being analyzed. An S.I.U. publication will be available by Oct. or Nov., 1970.

SUPPORTED BY U.S. Dept. of Agriculture

2.0023, RECREATIONAL IMPACT OF FEDERAL MULTI-PURPOSE RESERVOIRS

J.S. MATTHIAS, Purdue University, Joint Highway Research Project, *Lafayette - West Lafayette, Indiana* 47907

This research is a study concerned with the development of a model that can be used to predict recreational trips to new reservoirs in Indiana.

The model developed utilizes only road distance, county population, and the influence of other similar facilities as the parameters affecting attendance. A technique was developed illustrating how the model can be used to predict future attendance and traffic volumes.

Three Parks, Raccoon State Recreation Area on Mansfield Reservoir, Lieber State Park on Cagles Mill Reservoir, and Monroe State Park on Monroe Reservoir were used in the study. Data were collected by conducting interviews of twenty-five percent of arriving trips at the park entrances. Over 13,000 interviews were conducted over a two year period. Yearly distributions of trips by trip purpose and frequency were investigated.

The prediction model was developed by using non-linear regression analysis to determine the parameters of distance, population and the influence of other parks. Two equations were developed, one for the condition where there is no other park closer to a county than the park under consideration and the other for the condition where there is another park closer to a county than the park under consideration. Together, the two equations constitute the prediction model.

Continuing research includes: a) collection of data at the three reservoirs on a reduced sample basis, b) analysis of data on gasoline consumption by motor boats, c) analysis of changes in land use and land value near the reservoirs with time, d) evaluation of travel time versus travel distance as a trip making factor, and e) test the stability of the trip rate models previcusly developed.

SUPPORTED BY U.S. Dept. of Transportation - Public Rds.

2.0024, INDUSTRIAL AND ECONOMIC DEVELOPMENT IN RURAL AREAS

H.A. WADSWORTH, Purdue University, Agricultural Experiment Sta., *Lafayette - West Lafayette, Indiana* 47907 (IND01399)

OBJECTIVE: Identify the changes in the pattern of types and location of industries in Indiana; determine major economic factors which influence the location, determine the economic and social effects on the local community.

APPROACH: This project builds upon former work involving industrialization problems and the part they play in economic development, particularly in the southern part of Indiana. This study will dig deeply into the changing pattern of industrial location and will assess the reasons why plants have located in Indiana as well as some of the reasons why they have failed to locate here. It will make use of secondary data and on the spot evaluation in cooperation with the various agencies which are interested in local industrial development.

PROGRESS: Field work and analysis of development opportunities in a rural Indiana county is completed and thesis is in the final draft stage. Utilizing input-output analysis, the study revealed that the county economy would expand most rapidly from a given increase in final demand for locally provided personal services such as higher education. Of descending importance were further increases in outside employment opportunities, agriculture and recreation and tourism. Employment increases generated by such expansion would be greatest for outside employment opportunities, with personal services, recreation and tourism, agriculture and construction utilizing labor to a lesser degree. This study provides a basis for community groups to evaluate alternatives for stimulating local economic activity and employment. Underway at the present time are two studies. One is concerned with economic and non-economic factors affecting industrial location. A case study approach applied to the actual decision as made by a cooperating industrial firm provides the basic data for this. The second utilizes manufacturing employment information from the Employment Security Division to analyze and define economic areas. Also being measured is the tendencies for certain industries to concentrate or disperse.

SUPPORTED BY U.S. Dept. of Agriculture

2.0025, DETERMINING THE DEMAND AND ECONOMIC VALUES OF WATER RECREATION RESOURCES AT MACBRIDE STATE PARK, IOWA

M. GLASCOCK, Univ. of Iowa, Graduate School, *Iowa City, Iowa* 52240

The purpose of this study is to develop a use-prediction model which can be utilized in planning and developing water-based recreation areas in state parks in Iowa or areas with similar features. This will include a survey of present demand for existing water-based recreation facilities in the park, determination of socio-economic variables which may partially explain demand, and monetary values placed on water recreation areas and their use by the consumer.

Estimates will also be made of the resultant changes in policies, management, services, addition of facilities, expanded park use areas and proximity and design of areas and facilities, and their potential effect on use patterns.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

2.0026, A MANUAL OF ENVIRONMENTAL GEOLOGY AND LAND-USE PLANNING

P.L. HILPMAN, Univ. of Kansas, State Geological Survey, *Lawrence, Kansas* 66044

Will honor any reasonable request for further information. To evaluate the role of environmental geology and land-use planning on the city, county, and regional levels and to prepare a manual in lay language to facilitate application of the techniques and principals in other urban areas.

Accelerated urban sprawl throughout the United States has been accompanied by conflict between physical environment and land use. Construction failures, widespread pollution and unrealized mineral resources have resulted in significant economic losses. The study has been undertaken to evaluate land-use suitability as applied to urban activities.

Establish geologic criteria pertinent to the activities of waste disposal (solid and liquid) transportation (air, land, water) water supply (surface and subsurface) foundation design and construction, mineral-resource extraction, flood control, open space and recreation, underground utility networks, reclamation and urban renewal. Devise techniques for quantifying geologic factors in a manner directly usable by planners, engineers, and architects. The synthesis of data into factor and suitability maps will be explained and land-use-evaluation techniques described.

SUPPORTED BY Kansas State Government

2.0027, EVALUATION OF UTILIZATION OF KANSAS FORESTRY, FISH AND GAME COMMISSION LAKES FOR FISHING AND RECREATION

J.M. RAY, State Forest. Fish & Game Com., *Pratt, Kansas* 67124

P. S. Objective: To evaluate the utilization of Kansas Forestry, Fish and Game Commission Lakes for fishing, recreation and to determine the angler cost input-output relationship.

P. S. Procedures: 1. All types of recreationists at the lake will be sampled for survey data by biologists, biology aides, and other department personnel. 2. Recreational data will be placed upon a broad form separating various types of activity, including fishing, boating, bird watching, sight-seeing or other. Anglers creel survey data will be collected upon punch cards and completed trip data will be supplemented by mailable cards coded to correspond with punch cards for distribution to fishermen at time of interview. Car counters will be used at lake entrances to supplement utilization data. 3. Fisherman counts will consist of actual and complete counts during survey periods, with the possible exception of heavy use periods when periodic hourly counts will be made and computations used in arriving at a utilization figure for the period. 4. Creel survey data obtained on the punch cards can be processed by machine methods, or if programmed, on computers; however, dependent upon the amount of processing necessary, the cards will most likely be hand sorted for analysis. Through the processing, analysis, and expansion of data, information will be obtained on length of angler trips, catch composition and rate of success, total fishing effort, and total harvest. 5. During survey periods, data will be collected on water temperatures, air temperatures, water transparency, waterlevel measuremnts, and other information for coordination with other survey information. 6. The various costs related to providing angling at this site will be compiled, including acquisition of site, lake construction and major repair, annual operation and annual maintenance. Costs of capital improvements will be amortized over a 50-year period. The annual cost (input) determined by this procedure will be related to the man-days of fishing provided during the year (output) to arrive at a cost of providing a man-day of angling at the lake.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

2.0028, STATEWIDE WILDLIFE MANAGEMENT
J. BRUNA, State Dept. of Fish & Wl. Rso., *Frankfort, Kentucky* 40601

Objective: To obtain and calculate present monetary expenditures for recreational activities and compute the potential economic value of recreation on the entire portion of the streams under study.

Procedure: Economic data obtained from the recreational inventory under Job A, will be utilized to calculate the monetary values of the present and potential man-days recreation obtained under Job B. The Institute of Statistics at North Carolina State is providing guidance in developing statistical procedures for calculating the economic data and expansion factors.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

2.0029, STREAM AND STREAMSIDE RECREATIONAL STUDY
J.F. BRUNA, State Dept. of Fish & Wl. Rso., *Frankfort, Kentucky* 40601

The objective is to develop and field test statistical and other inventory techniques for measuring the present recreational use of portions of Rockcastle and Green Rivers and adjacent wildlife habitats. All of the recreational uses on the selected portions of the study streams will be inventoried by a clerk working three days a week. A recreational activity questionnaire will be utilized and personal interviews conducted. Three statistically selected sampling methods will be used involving access points, access roads and streamside plots. Each will involve sampling in time and space. The times of sampling (days and hours) will be determined by a drawing of random numbers. Space sampling will consist of dividing the stream and adjacent habitat into sampling units that can be covered during the allotted time period. These sampling units will be determined by access points, access roads, trails and topography. The results should furnish expenditure data, distance traveled, income groups, and total yearly recreational trips by recreational activities associated with a stream. This is one phase of a three phase project.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

2.0030, ECONOMIC IMPORTANCE OF RECREATION FACILITIES AND SERVICES TO KENTUCKY FARMERS
J.H. BONDURANT, Univ. of Kentucky, Agricultural Experiment Sta., *Lexington, Kentucky* 40506 (KY00063)

OBJECTIVE: Determine and evaluate the importance of recreation as a source of farm income, inventory or the type of recreation facilities available, the importance of location of recreation facilities in relation to population centers. Ascertain the capital, labor and other resource requirements in the development and operation of on-farm types of recreation facilities.

APPROACH: An inventory will be made of the different types of farmer-operated recreation facilities in about one half of the 120 counties in the state. Information will be obtained from County Agricultural Extension Agents, County Soil Conservation Service workers, and Vocational Agricultural Teachers. This will be followed by obtaining specific information of on-farm recreation facilities and related services. The schedules will be obtained from a sample of the significant types of recreation facilities.

PROGRESS: Further analysis was made of sources of water supply in rural areas, since practically all types of outdoor recreation facilities and services require a good source of water supply. Individual water systems are subject to quality and adequacy problems. On the other hand, rural water districts can provide a dependable water supply, especially for household use and for other uses in emergency periods. On the basis of costs that have prevailed in recent years, water districts generally can be developed on a favorable basis compared with individual systems in areas which have a consumer density of 12-15 or more connections per mile. Water districts, where feasible, are an important resource in development of outdoor recreation, both publicly and privately owned. Plans have been made for a detailed study of camping sites, facilities and related services in different parts of the state in 1969. Plans for initiating some of this research in 1968 were delayed due to the graduate student who started the research entering the armed forces. Additional research findings already completed will likely be published in 1969.

SUPPORTED BY U.S. Dept. of Agriculture

2.0031, ORGANIZATION AND INPUT-OUTPUT RELATIONSHIPS OF A MULTIPLE ENTERPRISE OUTDOOR RECREATION FIRM
J. GRUETER, Univ. of Maine, Agricultural Experiment Sta., *Orono, Maine* 04473 (ME00221)

OBJECTIVE: Determine and analyze the organization of existing privately owned campgrounds and other recreation firms. Design a model of a typical multiple enterprise recreation firm. Simulate a recreation firm with the model and obtain information for decision making.

APPROACH: A list of existing privately owned transit and vacation campgrounds primarily for York and Cumberland Counties will be compiled. Through personal interviews, information about the investments, costs, returns, organizations, and physical input-output coefficients of selected campgrounds will be obtained. On the basis of the data obtained, a typical multiple enterprise recreation firm model will be designed. The design of the model will enable it to handle all the different questions in connection with the economic analysis of a multiple enterprise recreation firm. Recreation firms will then be simulated using this model to get information such as: most efficient use of available land, labor and capital when used for recreation, economics of changing organization of existing firms, returns to scale and economics of combining enterprises.

PROGRESS: A list of existing private owned transit and vacation campgrounds, primarily for York and Cumberland Counties, has been compiled. A letter was sent out to get the cooperation of the campground owners. Different progressive campgrounds have been visited to obtain ideas for organizing the data collection and formulating model.

Manuscripts were completed and publications released on two parts of a three part series on the economic analysis of camping oriented recreation firms.

SUPPORTED BY U.S. Dept. of Agriculture

2.0032, ECONOMIC ANALYSIS OF ENVIRONMENTAL QUALITY EFFECTS ASSOCIATED WITH SEASONAL HOMES
D.M. TOBEY, Univ. of Maine, Agricultural Experiment Sta., *Orono, Maine* 04473

OBJECTIVES: Determine the environmental situations (positive and negative) associated with seasonal homes and analyze the attitudes, interests, and goals of people for a quality seasonal home environment. Evaluate the social and private costs and benefits of identified environmental situations at both the regional and national level. Determine the total potential market for seasonal homes in the Northeast and delineate the effects of environmental factors upon this market.

Approach: Case study method will be used in five selected areas: (1) Lake in organized township in Central Maine (2) Lake in densely populated area in Southern Maine (3) Lake in unorganized township in Northern Maine (4) Community in densely populated coastal area in Southern Maine (5) Community in sparsely populated coastal area in Eastern Maine. For each selected area major factors analyzed will be air, water and scenic pollution. Causes will be related to methods of waste and sewage disposal and effects of unplanned land use. Systems analysis will be used to estimate social costs and benefits generated by environment effects. Benefit: cost ratio will be computed wherever possible.

Progress, 7/69 - 6/70: Investigators compiled taxation data from five seasonal home areas in Maine, a mixture of coastal and inland (lakeshore) communities. These data are being used for the construction of a sample of seasonal homes from which financial and attitudinal data will be collected.

Two communities were selected as study areas to be included in the regional research effort. Questionnaires, standardized for use throughout the Northeast region, were prepared to elicit attitudinal responses from officials, permanent residents, and seasonal residents of these communities.

2. ECONOMICS

SUPPORTED BY U.S. Dept. of Agriculture

2.0033, RECREATION AND FOREST LAND USE PLANNING

J.C. WHITTAKER, Univ. of Maine, School of Forestry, *Orono, Maine* 04473

Objectives: Develop guidelines for multiple-use planning for optimum use of commercial forest lands by analysis of: 1. Economic input-output relationships for recreation; 2. Substitution relationships between recreation and other uses of commercial forest land; 3. Barriers to economically efficient resource allocation and how they condition multiple-use planning; 4. Patterns of resource allocation to optimize multiple use of forest lands within various constraints.

Methods: Information will be collected through personal interview and mail questionnaire surveys of users and non-users of commercial forest land for recreation. Case studies of forest landowner situations will be made to determine basic input-output relationships.

SUPPORTED BY U.S. Dept. of Agriculture

2.0034, ECONOMIC ANALYSIS OF THE CAMPGROUND MARKET IN MASSACHUSETTS

R.S. BOND, Univ. of Massachusetts, Agricultural Experiment Sta., *Amherst, Massachusetts* 01002

Objectives: (Dates shown indicate periods of anticipated research activity.) 1. To determine the motivations, goals, and characteristics of the camping public as a guide to development of a rational pricing system of public and private camping resource mix. 1972-73. 2. To determine the legal authority and policies which underlie the pricing and marketing decisions of public camping management agencies. 1970-72. 3. To determine the marketing and pricing practices of private firms providing camping. 1970-71. 4. To develop and evaluate alternative marketing and pricing systems in accordance with expressed goals of the general public, campground users, private firms, and public camping management agencies. 1973-74.

SUPPORTED BY U.S. Dept. of Agriculture

2.0035, RECREATION ECONOMICS

G.R. GREGORY, Univ. of Michigan, School of Natural Resources, *Ann Arbor, Michigan* 48104

A continuing project to develop the application of economic analysis to recreational problems. Most recent work has involved application of the theory of joint demand to developing a theory of demand for a particular forest recreation site. This forms a chapter of a new book, Forest Resource Economics, to be published by Ronald Press in early 1971.

SUPPORTED BY University of Michigan

2.0036, RECREATIONAL POLICIES AND PROGRAMS OF FOREST LAND-OWNING COMPANIES IN THE LAKE STATES REGION

C.R. CROWTHER, Michigan Technological Univ., Graduate School, *Houghton, Michigan* 49931

Objectives: 1) To make comparative evaluations of differences in recreation policies and programs among types of forest land-owning companies in the Upper Peninsula of Michigan. 2) To make comparative evaluations of differences between recreation programs of forest land- owning companies in the Upper Peninsula of Michigan and throughout the Lake States Region.

SUPPORTED BY U.S. Dept. of Agriculture

2.0037, AN ECONOMIC EVALUATION OF THE BENEFITS AND COSTS OF MICHIGAN'S ANADROMOUS FISH PROGRAM

P.V. ELLEFSON, State Res. & Dev. Division, *Lansing, Michigan* 48926

Objectives: The primary concern of the study is to carefully review present and expected costs of Michigan's Anadromous Fish Program and at the same time examine the benefits gained. Certain individual projects within the program will be evaluated as to their relative merits in achieving similar objectives.

Methods: Econometric models will be used to evaluate the program's outputs. Basic data will be obtained from a survey of 1970 Anadromous fishermen. Both supply and demand elements will be specifically recognized as they determine levels of consumption. The program's outputs and inputs will be reviewed in light of economic criteria such as (1) internal rate of return, (2) present net worth, and (3) the benefit-cost ratio. Simulated levels of angler days given various levels of present and future investment will also be reviewed.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

2.0038, BUSINESS TRENDS, ECONOMIC IMPACTS, INVESTMENT AND EMPLOYMENT POTENTIAL OF SKIING IN THE GREAT LAKES REGION

W.A. LEUSCHNER, U.S. Dept. of Agriculture, North Cen. Forest Expt. Sta., *Saint Paul, Minnesota* 55101

To evaluate the ski industry as an investment opportunity and source of local employment, to identify characteristics of financial success, and to find out how to identify areas of investment potential.

This project is completed and will be published in 1970 as USDA Forest Service Research Paper NC-46. The annotation for the publication should read: Describes the skiers and ski areas in the Midwest. Analyzes the market structure for the industy, the factors associated with financial success, the impact of spending on local economies, and the potential of ski area investment. Includes ski area financial statements.

The title of the paper is 'Skiing in the Great Lakes States: the Industry and the Skier.'

SUPPORTED BY U.S. Dept. of Agriculture

2.0039, AREA FINANCING OF WATER RESOURCE DEVELOPMENT

W.R. MAKI, Univ. of Minnesota, School of Agriculture, *Saint Paul, Minnesota* 55101

This study deals with the testing of economic criteria for locating and financing water recreation investments in a) high-density population centers and b) areas peripheral to major population centers. An economic model of the multi-state Twin Cities Metropolitan Region will provide the analytical framework for an intensive examination of the seven-county Twin Cities Metropolitan Area and a 10-county West Central Minnesota development area in the context of a) local demands for water recreation facilities and b) economic multiplier effects of water recreation activities.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

2.0040, COOPERATIVE FOREST RECREATION RESEARCH-UNIVERSITY OF MICHIGAN

J.T. MORGAN, Univ. of Minnesota, U.S.D.A. N. Cen. For. Ex. Sta., *Saint Paul, Minnesota* 55101 (NC1902)

OBJECTIVE: Stimulate and guide graduate study and research in forest recreation, and increase the supply of people qualified to do forest recreation research.

APPROACH: There will be three main lines of activity: (1) helping to mobilize the resources of the University and the Forest Service to do more and better recreation research; (2) helping graduate students in particular studies; and (3) doing research on special problems. The project leader will investigate special problems such as evaluation of visitor's information services and appraisal of the effects of interpretive programs on recreationists.

PROGRESS: The major current endeavor is a study of the business trends, economic impacts, investment and employment potential of skiing in the Great Lakes Region.

SUPPORTED BY U.S. Dept. of Agriculture

2.0041, AN ECONOMIC ANALYSIS OF THE LAKE OF THE WOODS-RAINY LAKES REGION OF MINNESOTA

J.M. STAM, Univ. of Minnesota, U.S.D.A. Economic Dev. Div., *Saint Paul, Minnesota* 55101 (ED7-10-24-01)

OBJECTIVE: Assess the relative importance and inter-relationships of the various industry sectors of the area's economy in terms of employment and income; evaluate the economic potential and determine which industry sectors would benefit from research and management efforts.

APPROACH: Using secondary data, analyze characteristics (age, sex, and race) and examine the distribution of the labor force among industries and occupations. Classify sources of income and employment according to whether the market is outside the local economy for products of agriculture, fisheries, and forestry, and for tourism, or whether the market is for local use of goods and services. Appraise leakages of income from the area through imports of goods and services. Using primary data, assess prospects for employment in important industries in the area. Results of the study will provide policy recommendations for use by legislators and businessmen.

PROGRESS: The study focuses on Koochiching, Lake of the Woods, and Roseau Counties of Minnesota, and emphasizes the economic analysis of the agricultural, forestry, recreation - tourism, and fishery sectors. An input - output analysis is now being conducted in the area which will provide useful insights into basic and non-basic employment and income. Mink ranching is important in the area as a user of rough fish from Lake of the Woods and Rainy Lake. Gross farm income from mink ranching totals about $800,000 annually or approximately 10 percent of total annual farm sales in the three counties.

SUPPORTED BY U.S. Dept. of Agriculture

2.0042, THE FEASIBILITY OF UNITIZED MANAGEMENT, OPERATION, AND MAINTENANCE OF WATER RECREATION FACILITIES IN MISSISSIPPI

D.C. WILLIAMS, Univ. of Southern Mississippi, School of Business Admin., *Hattiesburg, Mississippi* 39401

Water based recreation facilities in Mississippi are presently operated and maintained by several different agencies.

The objective of this project will be to study the feasibility of a single agency assuming responsibility for the operation and maintenance of all water based recreational facilities constructed by Federal and State agencies in Mississippi.

The present system of management will be studied. Water based recreation resource management practices in other states will be reviewed. Alternative management systems will be considered and a set of management and operation procedures will be recommended.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

2.0043, EVALUATION OF CRITICAL FACTORS IN THE LAND USE PLANNING PROCESS

K.C. CHILMAN, Univ. of Missouri, School of Forestry, *Columbia, Missouri* 65201

Objectives: (1) To formulate an accurate description of the land use planning process, especially as it applies to forested lands in the United States. (2) To determine who participates in forest land use planning, and how different parties plan and direct their participation to influence outcomes. (3) To increase technical effectiveness of methods of information collection, recall, and display used by foresters as they participate in forest land use planning. (4) To determine attitudes of participants in the land use planning process toward various forces and factors that influence outcomes of planning.

Approach: This research program encompasses projects of several graduate students and the investigators listed. Generally, objectives 1 and 2 will be approached through comparative case studies using decision models for analysis. Objective 4 is being approached through survey research methods.

SUPPORTED BY U.S. Dept. of Agriculture

2.0044, THE IMPACT OF HIGHWAY INVESTMENT ON REGIONAL ECONOMIC DEVELOPMENT

J.A. KUEHN, Univ. of Missouri, U.S.D.A. Economic Dev. Div., *Columbia, Missouri* 65201 (ED7-9-26-01)

Work on this project has been substantially completed. A manuscript for publication by the U.S. Dept. of Agriculture is being prepared. A doctoral dissertation, 'Highway Impacts on Ozark Incomes and Employment' is available from University Microfilms, Ann Arbor, Michigan. Recreation industries were one portion of total trades and services employment studied. Research mainly concerned highway impacts on incomes and employment in the Ozarks Region.

Highway impacts on Ozark incomes and employment are empirically analyzed by means of rank correlation and stepwise regression. Results indicate that highways are not a crucial factor in the Ozark region's development. If highways are built, then two-lane, paved, state- numbered roads connecting existing national routes and also local paved county roads connecting rural areas with urban centers would be more beneficial for economic development than other highway types. Highways with dissimilar qualities are classified into five distinct types using the number of lanes, type of surface, and network integration as criteria. Relevant regional economic growth theories are also reviewed.

SUPPORTED BY U.S. Dept. of Agriculture

2.0045, COLORADO COMPREHENSIVE PLAN FOR OUTDOOR RECREATION

W.R. CHENEY, Midwest Research Institute, *Kansas City, Missouri* 64110

Objectives of this project are to develop local participation data from primary sources to be used in updating the Demand, Supply, Needs, and Action portions of the Comprehensive Outdoor Recreation Plan for Colorado. Data from a study of the Economic Impact of Hunting and Fishing Activities by resident population are also being collected for use in a separate study as well as inclusion in the plan. The study is proceeding approximately on schedule. The data produced will provide a statewide mapping system on transparent overlays: county boundaries; highways, cities and towns and water courses, base map coding system with recreation inventory plotted, and topography at a scale of 1:250,000. This information is to be made available at the cost of reproduction to all agencies requesting data.

Procedure: Personal household interviews are being conducted on a statewide basis. Households are selected on the basis of a random sampling plan stratified by county, region, and S.M.S.A. Data will be projected on the basis of current population studies to the years 1970, 75, 80, 90, 2000, 2010 and 2020, for the Recreation Study. These projections when compared with measures of existing and potential supply will be used as the basis for needs statements now and in the future. The project was started in fiscal year 1967-68.

SUPPORTED BY U.S. Dept. of Interior - Bu. Outdoor Rec.

2.0046, AN ANALYSIS OF FACTORS AFFECTING RESOURCE USE AND INCOME POTENTIAL IN THE OZARKS OF MISSOURI

M.G. BLASE, Montana State University, Agricultural Experiment Sta., *Bozeman, Montana* 59715 (MONB00528)

OBJECTIVE: The objectives of this study are aggregate to the present and potential use of human and other resources in agriculture, recreation and tourism, forestry, manufacturing, retail trade, personal services, and others for the Missouri Ozarks, determine a frequency distribution of families by levels of income that will result from optimal development of resources, examine the institutional control of resources and the influence of local custom and desires on their development, describe the impediments to adjustments in resource use and evaluate the steps that may be taken to lessen their effect, determine the rapidity with which these adjustments may take place.

APPROACH: U.S. Census data, highway traffic counts, and various studies relating to resource adjustments in agriculture, forestry, recreation, manufacturing etc. will be combined in an analysis of development for the region.

SUPPORTED BY U.S. Dept. of Agriculture

2.0047, THE MONTANA DUDE RANCH INDUSTRY – A BASIC APPRAISAL

W.K. GIBSON, Univ. of Montana, Graduate School, *Missoula, Montana* 59801

2. ECONOMICS

One of the main problems in evaluating Montana's natural resources and their economic base is lack of good usable base data. It is the purpose of this study to provide a data base for the Dude Ranch Industry in Montana. These data should provide researchers with use requirements from the Dude Ranch portion of the total Outdoor Recreation demand in Montana.

The study will be carried out by personal interview of most of the operating dude ranches in Montana. The questionnaire will be divided into three basic parts: natural resource utilization, selected business characteristics of the dude ranch operation, and supply-demand relationships of the industry. It is hoped to set up a profile of Dude Ranching as the results of the field investigation.

SUPPORTED BY University of Montana

2.0048, ECONOMIC IMPACT OF HIGHWAY BEAUTIFICATION

M. BAKER, Univ. of Nebraska, School of Agriculture, *Lincoln, Nebraska* 68503

A study is conducted to ascertain the potential that exists for scenic enhancement, cultural and educational displays and outdoor recreation along interstate 80 in Nebraska. This study will investigate alternative public actions and controls as means to ensure the development and maintenance of aesthetically pleasing and socially beneficial patterns of land use adjacent to the interstate highway. The study will (1) determine the desires of residents and travelers, (2) ascertain the intentions of those who own land adjacent to the right of way with respect to development of that land, and (3) devise and recommend means for guiding the development of land and water resources adjacent to interstate 80. Interviews will be made with travelers on the interstate, owners of land adjacent to the interstate, and community leaders.

Document provided by Highway Research Information Service.

SUPPORTED BY U.S. Dept. of Transportation - Public Rds.

2.0049, ECONOMICS ANALYSIS OF RECREATION IN LAHONTAN RIVER BASIN

S.G. DETERING, Univ. of Nevada, Agricultural Experiment Sta., *Reno, Nevada* 89507 (NEV00296)

Develop and apply economic models to evaluate the competitive, complementary and supplementary relationships among recreational areas and facilities. Develop and test analytical procedures to determine the relationships among recreational, agricultural and other needs for water and related sources. Explore methods of evaluating economic impacts of water based recreational developments on local communities and river basins. Develop and use economic models in making projections of outdoor recreation in central Lahontan Basin for specific time periods.

Recreational facilities will be appraised for their capacity to provide recreational opportunities. Analytical systems will be developed embodying site location and quality and visitor use data to ascertain competitive, complementary and supplementary relationships affecting demand for recreation. Time, location and quality attributes will be examined for their influence and value of water for recreation in alternative uses. Projections of outdoor recreation activity will be made based upon above procedures and methodology.

SUPPORTED BY Nevada State Government

2.0050, ECONOMICS OF BIG GAME RESOURCE USE IN NEVADA

J.R. GARRETT, Univ. of Nevada, Agricultural Experiment Sta., *Reno, Nevada* 89507

Develop simulation models of resource use in big game production. Determine bioeconomic relationships for inputs of simulation model. Demonstrate application of models in big game management and policy decisions.

Expenditures and factors influencing type and location of expenditures for big game hunting will be obtained from a mail questionnaire of licensed hunters. The relationships between these factors and hunting expenditures will be determined using chi-square analysis. Demand for major big game species in Nevada will be determined primarily by using expenditures as a proxy for price. Data from a companion study of consumptive use of habitat by wildlife and domestic livestock will be used to determine costs and benefits of alternative and multiple uses of big game ranges.

SUPPORTED BY U.S. Dept. of Agriculture

2.0051, BIG GAME MANAGEMENT ALTERNATIVES THROUGH BIOECONOMIC MODELS

J.R. GARRETT, Univ. of Nevada, Agricultural Experiment Sta., *Reno, Nevada* 89507 (NEV00214)

OBJECTIVE: Develop simulation models of resource use in big game production. Determine bio-economic relationships for inputs of simulation model. Demonstrate application of models in big game management and policy decisions.

APPROACH: Expenditures and factors influencing type and location of expenditures for big game hunting will be obtained from a mail questionnaire of licensed hunters. The relationships between these factors and hunting expenditures will be determined using chi-square analysis. Demand for major big game species in Nevada will be determined using primarily expenditures as a proxy for price. Data from a companion study of consumptive use of habitat by wildlife and domestic livestock will be used to determine costs and benefits of alternative and multiple uses of big game ranges.

PROGRESS: Work to date has been concentrated on mail questionnaires sent to hunters to accomplish Objective 1 of this project. Data for 1967 is currently being analyzed and a questionnaire relative to the 1968 hunting season is in process. These two sets of data will be analyzed for hunter characteristics and demand functions in a master's thesis. A descriptive bulletin on hunter characteristics will be published during spring or summer of 1969. The above analysis will supply 'value' for the remaining objectives in the project.

SUPPORTED BY U.S. Dept. of Agriculture

2.0052, THE ECONOMIC DEMAND FOR OUTDOOR WATER-BASED RECREATION IN NEVADA - PRESENT AND FUTURE

J.G. MCNEELY, Univ. of Nevada, Agricultural Experiment Sta., *Reno, Nevada* 89507 (NEV00262)

A study of the interrelationships of demand for outdoor water-based recreation at Northwestern Nevada lakes was completed in June. Eighty percent of all visits to the lakes studied were by persons living within 90 miles of the lakes. Results indicated that the lakes are substitutes for one another. This was based on a multiple regression analysis which used distance as a proxy for price. Distance proved to be an important variable in explaining variation in vists per capita. Logarithmic transformations provided better demand equations than those derived from nontransformed data. The regression coefficients were insignificant for income and age.

Data to determine the demand for boating for the entire state has been gathered by two separate mail questionnaires. The analysis of this data will provide estimates of total boating demand by Nevada boaters for both instate and out-of-state waters. Projections of future boating demand will be made utililizing this data and boat registration data.

The present and future demand for other forms of water based recreation will be estimated as data is collected.

SUPPORTED BY U.S. Dept. of Agriculture

2.0053, A STUDY TO DEVELOP AND APPLY METHODOLOGY TO DETERMINE MARINE FUEL TAXES PAID BY BOATERS IN NEVADA

J.G. MCNEELY, Univ. of Nevada, School of Agriculture, *Reno, Nevada* 89507

Nevada recently passed legislation to divert gasoline taxes attributable to boat use to the provision of boating facilities. The absence of accurate estimates of marine fuel taxes made it necessary for the legislature to approximate the amount thought representative of annual marine fuel taxes paid. This amount was set at $60,000. In 1968, a short term study by this division to estimate boating fuel use in Nevada found that marine fuel taxes paid in Nevada were nearly three times this amount. Since this was a short term study, an interim raise in the allotment to $100,000 was proposed. This passed the Nevada Legislature.

The current study is for two years with the Highway Department, Fish and Game Department, and Parks Department all sharing in the funding. The general objective of the study will be to develop methodology that will facilitate accurate estimates of taxes paid for marine fuel used by boaters on Nevada waters. The methods developed should be capable of being updated without need for further comprehensive investigation. The questionnaire used for this study will be of significant scope that the demand for boating in Nevada will be obtained.

SUPPORTED BY Nevada State Government

2.0054, AN ECONOMIC APPRAISAL OF THE MULTIPLE USE OF WATER OF THE NEWLANDS RECLAMATION PROJECT IN NEVADA

J.G. MCNEELY, Univ. of Nevada, School of Agriculture, *Reno, Nevada* 89507

The Newlands Project became operational in 1905. This project includes a canal to transport water out of the Truckee River system and into the Carson River Basin. The project includes a reservoir to hold water for irrigation purposes and is used for recreational purposes as well. It also includes 70,000 acres of land that is irrigated by using the combined waters from the Truckee River and the Carson River and in addition there is a National Wildlife Refuge which obtains the surplus water from the project. Hunting and fishing are allowed in the national wildlife area. In recent years there has been considerable controversy over the water that is being diverted from the Truckee River. The terminal end of the Truckee River flows into Pyramid Lake, which is the terminal end of the river. The lake is used extensively for recreational use and is the sole means of support for the Pyramid Lake Indian Tribe. The current study is devoted to determining the economic value of water used and alternative uses within the Newlands Project for agricultural, recreation, hydro-electric power, and wildlife benefits. The objectives of the study are as follows: 1. to determine present and future yields, acreages, and values of irrigated crops and determine present and future demands of water for power generation and municipal and industrial uses. 2. to determine present and future use and values of water and related land resources with respect to water-based recreation and associated wildlife induced recreation; and 3. to identify and analyze competitive and complementary relationships among water uses.

SUPPORTED BY Nevada State Government

2.0055, DEMAND FOR OUTDOOR RECREATION OPPORTUNITIES IN NEVADA

J.G. MCNEELY, Univ. of Nevada, School of Agriculture, *Reno, Nevada* 89507

Rapid growth, intra-city problems, and increasing leisure time and mobility of both resident and nonresident populations require continual evaluation of demands for outdoor recreation areas and facilities. This information is required to update Nevada's comprehensive outdoor recreation plan to meet the changes that have occurred since the preparation of the original plan during the year 1964-65. The study is progressing with two phases going on concurrently. One phase involves the collection of recreation use data from all state, federal, and local public recreational areas. This data is being compiled for as many years in the past as are available. This data will be projected into the future to estimate the demands for public outdoor recreation facilities. The other phase of the study involves sending questionnaires to a random sample of the Nevada residents. This questionnaire will seek to find out what outdoor recreation activities citizens in the state are doing during their leisure time. The data obtained from this questionnaire will allow for the compilation of total demand for each activity on a statewide basis. The objectives of the study are: 1. to develop a work plan for collecting, compiling, analyzing, and storing of demand data; and 2. to identify existing demands and to project these demands to major types of outdoor recreation activities.

SUPPORTED BY Nevada State Government

2.0056, LANDOWNER QUESTIONNAIRE

D.E. SPRINGER, State Fish & Game Department, *Concord, New Hampshire* 03301

Project Objective: To analyze the present and future availability of private land in New Hampshire for recreational use by the public.

Job Objective: To determine the extent of land posting throughout New Hampshire and to discover the sociological motivation behind posting.

Procedure: A landowner questionnaire will be formulated to obtain information regarding amount, use, value, and condition of land owned, landowner beliefs and attitudes toward posting, family composition and interests, together with other pertinent variables which may influence posting. 7,500 questionnaires will be distributed to landowners within a randomly chosen group of New Hampshire towns. Followup for non- response will be by mail.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

2.0057, EFFECTS OF PAWTUCKAWAY STATE PARK ON LOCAL ECONOMY & THE ORGANIZATION & FINANCING OF LOCAL GOVERNMENT OF 4 SOUTHEASTERN NEW HAMPSHIRE TOWNS

G.E. FRICK, Univ. of New Hampshire, Inst. of Nat. & Environ. Rsou., *Durham, New Hampshire* 03824

The research philosophy is to record and analyze the economic changes in a region caused by the introduction of a large public investment in an outdoor recreation facility. A survey completed before the Park was built provides an initial economic activity measurement. Annual data relating to economic indicators such as local government expenditures, land transfers and valuations, Park users and their expenditure patterns are collected. Some of these series go back to 1960. The final work will involve a survey of business firms in the four towns to determine their economic ties to the Park.

A simulation model is being developed to use this economic information. This model is designed to test alternative land use-essentially park development versus private recreational development. It will estimate use of resources, need for public services and environmental characteristics. The direct monetary phases of the model will compare income and expenditure flows to the region associated with public versus private development. The model will be time oriented so that various rates of development of alternative land uses can be measured.

SUPPORTED BY U.S. Dept. of Agriculture

2.0058, AN ECONOMIC STUDY OF THE DEMAND FOR OUTDOOR RECREATION

J.R. GRAY, New Mexico State University, Agricultural Experiment Sta., *Las Cruces - University Park, New Mexico* 88070 (NM00167)

OBJECTIVE: Guidelines for public and private agencies to use in formulating policies affecting the recreational use of regional and area resources. Develop methods and procedures for estimating the demand for and economic impact of recreation. Apply the methods and procedures developed above in determining the characteristics of demand for and impact of outdoor recreation in specific situations.

APPROACH: The work will consist of examining, refining and extending existing theory and current methodology for measuring demand and impact on local economics of present and anticipated outdoor recreational developments. The theoretical models developed will be tested based on situations in north central New Mexico. Procedures will also include development of techniques for collection and the collection and analysis of cross sectional and/or time series data.

PROGRESS: The work plan for accomplishing regional objectives was completed. Secondary materials have been collected dealing with the demand for the need of recreational facilities in northcentral New Mexico. Local officials were interviewed in the study area and the field leader inspected both sites being proposed for recreational development in the study area as well as competing developed recreational areas near the study area.

Completion of the five-year project will provide local and state officials with an economically feasible plan for development of underutilized natural and human resources in an economically depressed area.

SUPPORTED BY U.S. Dept. of Agriculture

2.0059, IMPLICATIONS OF NON-FARM RURAL LAND IN NEW YORK
B.T. WILKINS, State University of New York, School of Agriculture, *Ithaca, New York* 14850

This projct attempts to develop procedures to: determine the amount of land used in New York for non-agricultural, non-urban purposes; determine characteristics and value profiles of owners of these lands; determine impacts upon community services of these forms of land use.

Interviews were conducted with a five percent sample of owners of 10 or more acres in three counties. The counties represent varying levels of urbanization and, those with and without tax maps.

Most of this land is believed held for recreational purposes (broadly defined). The land represents between one-third and one-half of the area of the Northeastern United States.

SUPPORTED BY State University of New York

2.0060, ECONOMIC ANALYSIS OF THE CAMPING MARKET IN THE NORTHEAST
B.T. WILKINS, State University of New York, School of Agriculture, *Ithaca, New York* 14850

Determine marketing and pricing practices of private firms and public groups providing camping and to evaluate alternative marketing and pricing systems.

Personal interviews will be held with a random sample of private campground operators, and public agencies. Pricing and marketing practices will be determined.

Goal statements by campers, operators and agencies will be used to conceptualize alternative marketing opportunities. Reactions to the alternatives will be obtained from a sample of those audiences.

SUPPORTED BY State University of New York

2.0061, SELECTED GEOGRAPHIC FACTORS RELATED TO THE CAMPING MARKET GROWTH IN THE NORTHEAST
G.H. MOELLER, State University of New York, U.S.D.A. Forest Service, *Syracuse, New York* 13210

The specific problem considered in this study is how has the growth of the camping market in the northeast been influenced by spatially identifiable environmental variables and demand factors, and on the basis of past market growth trends, where is camping market growth likely to occur in the future? The 6-year growth in both the commercial and public camping markets will be related to selected environmental- locational variables.

SUPPORTED BY U.S. Dept. of Agriculture

2.0062, RENTAL OF SNOWMOBILES AS A RURAL ENTERPRISE
G.H. MOELLER, State University of New York, U.S.D.A. Forest Service, *Syracuse, New York* 13210

The objective of the study is to investigate ways by which the rural land owner can benefit from increasing demand for snowmobile services and facilities, particularly near urban areas. Case studies of several commercially operated snowmobile areas will be conducted to determine the profitability, management problems and requirements for operating a commercial snowmobile enterprise.

SUPPORTED BY U.S. Dept. of Agriculture

2.0063, FOREST RECREATION DEMAND AND COOPERATIVE FOREST RECREATION RESEARCH
E.L. SHAFER, State University of New York, School of Forestry, *Syracuse, New York* 12224 (NE1902)

OBJECTIVE: Develop methods of predicting forest recreation demand: explore ways private forest owners can profit from forest recreation; stimulate and assist research by graduate students in problems of forest recreation.

APPROACH: The Project Leader will act as advisor for graduate research related to outdoor recreation. Capable students will be recruited from Syracuse and other nearby universities. Research by the Project Leader will seek methods for projecting future recreation demands, including socio-economic characteristics of northeastern recreation visitors.

PROGRESS: Research has provided recreation-resource planners with a more precise definition of the factors that influence recreation demand for Adirondack campgrounds. Results of a landscape preference model may reinforce or complement intuitive forest landscape management decisions, and suggest possible management alternatives when qualitative landscape evaluation standards seem inadequate. Interview results with campground managers suggest that certain kinds of recreation planning and research information can be obtained more easily and much less expensively from managers than from recreationists. Optimum research designs have been described that allow researchers to conduct multiple- use experiments involving deer and timber production at various costs and maximum information levels.

SUPPORTED BY U.S. Dept. of Agriculture

2.0064, WINTER SPORTS STUDIES
E.L. SHAFER, State University of New York, School of Forestry, *Syracuse, New York* 12224

Economic, social and physical development studies related to any aspect of winter sport, activities such as skiing, cross-country skiing, snowmobiling, mountain hiking, bob-sleighing, rescue operations and accidents. Resort area development, site planning, user socio-economic habits, economic impact of winter sports on human behavior.

SUPPORTED BY U.S. Dept. of Agriculture

2.0065, RECREATIONAL OPPORTUNITIES AND RESOURCES ON SMALL WOODLANDS
J.C. WHITTAKER, State University of New York, School of Forestry, *Syracuse, New York* 12224 (NE1903)

OBJECTIVE: Explore problems and opportunities of income producing forest recreation on privately owned lands.

APPROACH: This work unit is devoted entirely to the 'private sector' of outdoor recreation, and how it can profitably help meet America's growing demand for a wide variety of recreation opportunities, and how it can be coordinated with the 'public sector.' Individual and group enterprises will be studied as to location, make-up, association with nearby enterprises, and their place within the community and region. Research emphasis will seek the criteria and requirements for profitable outdoor recreation. Impact of the various segments of the private sector upon rural economies will be measured.

PROGRESS: Private woodland owners appear to have good opportunities for leasing their land to recreationists. Most recreationists will pay a rental sufficient to cover property taxes and a little more. Lands having a small lake or navigable stream command higher rental rates. Special interest groups such as archers and golfers will frequently pay very attractive rental rates. Land leasing by commercial and private club shooting preserves, as well as hunting or shooting clubs, seem to afford woodland owners a genuine opportunity for increasing income from their lands.

SUPPORTED BY U.S. Dept. of Agriculture

2.0066, A SURVEY OF INDIVIDUALS AND ORGANIZATIONS LEASING PRIVATELY-OWNED LAND RESOURCES FOR OUTDOOR RECREATION IN NEW YORK
J.C. WHITTAKER, State University of New York, U.S.D.A. Forest Service, *Syracuse, New York* 13210

To determine why and how individuals and organizatons lease private land for outdoor recreation, the kinds and amounts of land leased, the rates paid, and if there is likely to be any future demand to lease land for outdoor recreation.

SUPPORTED BY U.S. Dept. of Agriculture

2.0067, A STUDY OF USES OF SMITH ISLAND, NORTH CAROLINA

M.V. RULISON, Res. Triangle Institute, *Durham - Research Triangle Pk., North Carolina* 27709

The purpose of this project is to assist the state of North Carolina in evaluating the uses that it might make of Smith Island, at the mouth of the Cape Fear River, assuming it acquires possession of this Island. The project tasks include establishing objectives to be achieved in the use of Smith Island, defining a range of alternative uses representing varying intensities and costs of development, and evaluating each alternative use in terms of its advantages and disadvantages relative to the objectives established in the first task.

One of the major possible uses of the Island is for some type of State-operated recreation area.

SUPPORTED BY North Carolina State Government

2.0068, COOPERATIVE FOREST RECREATION RESEARCH-NORTH CAROLINA STATE UNIVERSITY

L.W. TOMBAUGH, U.S. Dept. of Agriculture, S.E. Forest Experiment Station, *Raleigh, North Carolina* 27607

Objective: Guide graduate research in economic aspects of forest recreation. Conduct research in the areas of (1) economics of recreational and other non-timber uses of commercial forest lands, and (2) non-market values of forests and other wildlands.

Progress: Two studies are currently in progress. One is a pilot study to try to estimate the magnitude of option value and existence value of the existing stock of wilderness as expressed by members of a major private conservation association.

The second study in progress is an examination of the practical considerations involved in using computer graphics techniques as aids to recreation planning. It is expected to provide important inputs into future studies dealing with non-timber uses of commercial forest lands.

SUPPORTED BY U.S. Dept. of Agriculture

2.0069, RECREATION DEVELOPMENT

R.W. COX, North Dakota State University, Agricultural Experiment Sta., *Fargo, North Dakota* 58103 (ND-S-03-013)

OBJECTIVE: Inventory outdoor recreational resources and facilities in North Dakota and to evaluate them in terms of present and future needs; compare recreational programs in North Dakota with those in other states; determine the economic benefits to the community arising from the utilization of the facilities and recommend action programs for selected areas to aid in development and expanded use of these facilities.

APPROACH: Inventory of present recreational resources and facilities. Utilization of resources and facilities identified in terms of present and projected demand. Experience of other states with recreational facility development will be surveyed to provide data on costs and development programs that could be used in North Dakota. Studies of specified North Dakota recreation areas to determine economic benefit to areas and communities will be made.

PROGRESS: The following phases of the project related to objective 1 have been completed: Development of an inventory of recreation areas and facilities under various governmental and private controls in each of the economic areas of North Dakota. An analysis of the present and future recreation needs of residents in relation to areas and facilities now available or in the planning stage. The findings will be of particular assistance to the North Dakota Outdoor Recreation Agency in their planning operations related to outdoor recreation areas and facilities. Work is now in progress in the determination of: Travel and recreation plans of North Dakota residents vacationing in other states and countries. Recreation and other activities of nonresident vacationers traveling in North Dakota.

Analysis of results obtained from a mail survey of 4,200 North Dakota households is underway. The purpose of survey was to determine recent changes in proportion of persons participating and degree of present and anticipated participation in specified outdoor recreation activities. A publication, 'Recreation Activities of North Dakota Residents,' by Rex W. Cox and Jerome E. Johnson will be available September 1, 1970.

SUPPORTED BY North Dakota State Government

2.0070, EVALUATING URBAN CORE USAGE OF WATERWAYS AND SHORELINES

I. WHITMAN, Battelle Memorial Institute, *Columbus, Ohio* 43201

Resource and Physical Components - (1) Large water bodies, including navigable rivers, estuaries, and the Great Lakes. (2) Small water bodies, including inland rivers and lakes (3) Urban land, water- related shoreline, flood plains, and valleys.

Social-Economic-Political Components - (4) The public, economic, social, environmental, and recreational needs (5) The economic base, industrial, and commercial needs (6) The political process, governmental, and institutional frameworks.

The proposed research is intended to develop means for evaluating interactions relating to the urban core sector of metropolitan areas among these components. It would consider social criteria for urban improvement in a framework traditionally employed for economic analyses of water development. Social criteria would be formulated as workable inputs in urban water planning to test the hypothesis that the real needs and problems facing urban society can be met, in part, through the development of water and related land resources.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

2.0071, PUBLIC INVESTMENT CRITERIA FOR WATER-ORIENTED RECREATION IN THE LAKE ERIE BASIN

R.A. TYBOUT, Ohio State University, Graduate School, *Columbus, Ohio* 43210

The project has three parts: 1) The measurement of demand for water-oriented recreation at numerous sites. 2) Analysis of costs of pollution abatement and recreation facilities at the same sites. 3) Evaluation of the relative merits of alternative public investments for recreation enhancement and of selected financial policies.

Each part is assigned a year of research time. Demand will be measured by a simultaneous-origin adaptation of the Hotelling-Clawson method. Shifts in demand due to pollution and income changes will be measured and, in fact, play an important part in the determination of benefits from abatement. The analysis of costs of pollution will seek to relate marginal pollution contributions at recreation sites to costs of abatement. The third, or final part of the analysis will explore the implications of combining the results of the first two parts in a cost- benefit framework with various methods of financing, including pollution taxes, user charges and other revenue sources.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

2.0072, FORT COBB CROW ROOST STUDY

G. IAMS, State Dept. of Wildlife Cons., *Oklahoma City, Oklahoma* 73105

Objectives: To measure the recreation and economies associated with the Fort Cobb Crow roost population.

Procedures: 1. Random Field Survey - A map of the Fort Cobb Lake Area will be studied and all farm residents within a 20 mile radius will be interviewed and made aware of the study. 2. An actual hunter survey will be conducted during fall and winter. Hunters will be interviewed in the field, cafes, motels or anywhere that the opportunity is afforded. Data will include total number resident hunters, total number non-resident hunters, total crows killed, average number hours hunted, different type of hunting and the average expenditure of each hunter. A chart showing hunting pressure and a graph showing build-up, peak and decline will be prepared. 3. Distribution will be studied. 4. Flyway time counts will be made. 5. Study will be made of depredation to peanut crops in vicinity.

2. ECONOMICS

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

2.0073, RESOURCE USE AND POTENTIALS IN SELECTED LOW-INCOME RURAL AREAS OF OKLAHOMA AND NEARBY STATES

F.K. HINES, Okla. St. Univ., U.S.D.A. Economic Dev. Div., *Stillwater, Oklahoma* 74074 (ED9-5-38-01)

OBJECTIVE: Inventory the existing physical and human resources in selected low-income rural areas of Oklahoma and nearby States and appraise their current and potential uses.

APPROACH: Assemble and evaluate existing information on physical and human resources. Classify the rural population into employability groups and apply the results to Census figures to estimate the relative employability of the population. Analyze the potential effects of local industrialization, forestry, recreational, or other resource developments on employment and income as a basis for evaluating area redevelopment programs and alternative opportunities for use of human resources. Appraise income opportunities resulting from the realization of the occupational potential of the labor force.

PROGRESS: An input-output five sector model was developed for Oklahoma. Multipliers were derived and forecasts of future output requirements made. The multipliers and forecasts provide measures of the changes in production, income, and employment for each sector of the economy. These measures can be used to evaluate economic impact of development programs and projects.

SUPPORTED BY U.S. Dept. of Agriculture

2.0074, COMPARISON OF RECREATIONAL USE AND FISHERY HARVEST ON A CLEARWATER, SMALLMOUTH BASS STREAM IN SOUTHEASTERN OKLAHOMA

R.C. SUMMERFELT, Okla. St. Univ., School of Arts, *Stillwater, Oklahoma* 74075

The objectives of this study will be: 1. To estimate the man-days of fishing, number of canoe trips and total fishery harvest per month on a stream above and below a reservoir. 2. Evaluate the economic impact on the sport fishery and recreational value (canoe trips) of the stream above and below a mainstream impoundment.

The data will be obtained by creel census of fishermen and inventory of canoe trips above Broken Bow Reservoir to the Oklahoma border. Also, the same data will be collected below the reservoir to where the stream flows into the Little River. The economical value of the sport fishery above and below the reservoir will be used to estimate the economic affect of a reservoir on a stream sport fishery. These data are important to mitigate loss of sport fishing by impoundment and to determine affects of the reservoirs on the portion of the stream not inundated. These data may be used in the future to calculate the cost- benefit ratio of future reservoirs.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

2.0075, TRAVEL RESTRAINTS AND THE BALANCE OF PAYMENTS

R.W. TRENTON, Okla. St. Univ., Graduate School, *Stillwater, Oklahoma* 74075

Analysis of the U. S. Treasury Proposal to tax travelers beyond the Western Hemisphere in order to save foreign exchange and help the balance of payments. The study is based on official estimates but in a more theoretical framework reaches the conclusion that the proposal could not have reached its stated objective if Congress had accepted it.

Document provided by Highway Research Information Service.

SUPPORTED BY No Formal Support Reported

2.0076, AN ECONOMIC STUDY OF THE DEMAND FOR OUTDOOR RECREATION

H.H. STOEVENER, Oregon State University, Agricultural Experiment Sta., *Corvallis, Oregon* 97331 (ORE00851)

OBJECTIVE: Develop methods and procedures for estimating the demand for and economic impact of recreation; and apply the methods and procedures developed above in determining the characteristics of demand for and impact of outdoor recreation in specific situations.

APPROACH: The work in Oregon will be concerned with both sub- objectives of the regional project outline. Recreational demands will be evaluated using the methods employed by Clawson, Brown, Singh, Castle, and Stevens for recreational services which use resources of different physical characteristics. The demands will be related to sociological characteristics of the recreationist. Primary data will be collected by personal interviews with recreationists in the Deschutes National Forest in Oregon.

PROGRESS: During the past year progress was made on this project in two major areas: Estimation of the demand for certain outdoor recreational services was conceptually specified. While this theoretical work is not complete, a model has been derived which allows for the inclusion of variables in the demand model which have heretofore not been taken into account. These variables include both physical characteristics of recreation sites and socio-economic characteristics of recreationists. Empirical data were collected through personal interviews with recreationists in the Deschutes National Forest in Central Oregon.

SUPPORTED BY U.S. Dept. of Agriculture

2.0077, ECONOMIC BENEFITS FROM AN IMPROVEMENT IN WATER QUALITY

H.H. STOEVENER, Oregon State University, School of Agriculture, *Corvallis, Oregon* 97331

The research has the following principal objectives: 1. To determine the relationship between water quality and recreational use, permitting the prediction of the change in recreational use when a substantial improvement in water quality has been made in a large body of water. 2. To determine the economic benefits accruing to society from a postulated improvement in water quality and associated increase in recreational use determined under (1) above. 3. To determine the economic benefits accruing to the local economy in which the water resource is located from the postulated improvement in water quality and associated increase in recreational use.

The accomplishment of objectives 1 and 2 involves the development of a theoretical model to evaluate recreational benefits. Such a model is an extension of the techniques developed by Clawson and others. Water quality characteristics are to be included in the demand analysis to permit the empirical changes in recreational use and values. Interviewing techniques are used to collect data for the research. Recreationists are interviewed in the upper Klamath Lake area and a sample of other recreational sites in nearby regions.

To accomplish objective 3, an input-output model for the Klamath County economy resulting from an improvement in water quality in Klamath Lake and the associated increased use and expenditures made by recreationists. Data for this work are developed through interviews with business firms in Klamath County.

SUPPORTED BY U.S. Dept. of Agriculture

2.0078, AN ANALYSIS OF THE DEMAND FOR DIFFERENT RECREATIONAL SERVICES

H.H. STOEVENER, Oregon State University, Agricultural Experiment Sta., *Corvallis, Oregon* 97331

The proposed project would first classify recreational services related to particular natural features of an area-- lakes, mountains, woodlands, unique natural phenomena, etc. Economic and statistical methods would be used to estimate the value of these features singly and in combinations. The methods would be applied to an actual case area-- the Bend Ranger District of the Deschutes National Forest in Oregon-- which contains a large variety of recreational features. The study will add a new dimension to research on the evaluation of recreation resources by relating values to the specific services rendered by particular attributes of such resources. The results would be published in professional papers or a monograph. Interim papers are available.

SUPPORTED BY Resources For The Future Inc. - Washington

2.0079, SCOPE OF OUTDOOR RECREATION PROGRAMS IN THIRTY-FIVE CITIES IN THE PACIFIC NORTHWEST

D.D. LINDLEY, Univ. of Oregon, Graduate School, *Eugene, Oregon* 97403

The purpose of this study was to investigate the role of tax supported municipal and district recreation agencies in providing programs related to the understanding and use of natural outdoor recreation areas and facilities in the Pacific Northwest States.

The objectives of the study were: 1) To determine the current outdoor recreation programs and services offered by the municipal and district recreation agencies; 2) To analyze the extent to which programs or services sponsored or conducted by the municipal and district recreation agencies related to the available outdoor recreation resources; 3) To discover if the municipal and district recreation departments in the Pacific Northwest consider outdoor recreation instruction and programs as major responsibilities of community recreation.

The study was limited to thirty-five cities located in the Pacific Northwest states of Idaho, Montana, Oregon and Washington. The selected cities or districts each had a population of at least 20,000 and each had a tax-supported municipal or district recreation department.

SUPPORTED BY University of Iowa

2.0080, DETACHED WORKERS PROGRAM

UNKNOWN, Garfield East Lib. Sch. Dist., *Pittsburgh, Pennsylvania*

Basically, these detached worker projects, though tailored to fit the area in which they operate, are designed to produce positive changes in the attitude and behavior of the young people involved. These projects provide a wide variety of activities such as tutorial services, arts and crafts, social events, physical fitness, outdoor sports, weekend camping trips, educational tours, movies, special meetings, and similar programs.

SUPPORTED BY Sarah Mellon Scaife Foundation

2.0081, DETACHED WORKER PROGRAM

UNKNOWN, Pittsburgh Government, *Pittsburgh, Pennsylvania*

A second grant, covering a two-year period, has been made in the 27th Ward of the city. Basically, these detached worker projects, though tailored to fit the area in which they operate, are designed to produce positive changes in the attitude and behavior of the young people involved. These projects provide a wide variety of activities such as tutorial services, arts and crafts, social events, physical fitness, outdoor sports, weekend camping trips, educational tours, movies, special meetings, and similar programs.

SUPPORTED BY Sarah Mellon Scaife Foundation

2.0082, ECONOMIC ANALYSIS OF ENVIRONMENTAL QUALITY EFFECTS ASSOCIATED WITH SEASONAL HOMES

H.B. GAMBLE, Penn. State University, Inst. For Res. on Land & Water, *University Park, Pennsylvania* 16802

The objectives of the research project are: 1. Determine the environmental situations (positive and negative) associated with seasonal homes and analyze the attitudes, interests, and goals of people for a quality seasonal home environment. 2. Evaluate the social and private costs and benefits of identified environmental situations at both the regional and national level. 3. Assess current and alternative institutional arrangements intended to correct inefficiencies and inequities in resource use in seasonal home communities.

This project is a cooperative regional research undertaking involving six universities. These are: The University of Vermont, The University of Maine, the University of Rhode Island, the Pennsylvania State University, Rutgers University, and the University of Delaware.

SUPPORTED BY U.S. Dept. of Agriculture

2.0083, DATA AND TRENDS OF RHODE ISLAND AGRICULTURE

L.W. GRIFFITHS, Univ. of Rhode Island, Agricultural Experiment Sta., *Kingston, Rhode Island* 02881 (RI00101)

OBJECTIVE: Assemble and analyze data which best describe the economic phases of Rhode Island Agriculture and allied fields.

APPROACH: Data collected for tabulation and analysis from U.S. census, crop reports, R.I. Employment Reports, Sales Tax Reports, Agricultural Price Reports, New England Reports, Weather Records, Financial and Tax Reports, etc.

PROGRESS: Data on Rhode Island Agriculture, conservation and recreation areas, forests, water areas, and land uses, as well as population and housing have been collected and summarized. Figures on sales taxes, industry employees, wages, real estate taxes, building permits, government contracts and other economic indicators are collected monthly, quarterly or annually and analyzed. These results are available to all members of the department, the college of agriculture, and other university personnel for use in seminars, reports, TV appearances, etc. Several charts used in various publications have been prepared for photographing and printing. Requests from libraries, newspapers, tax officials, schools, colleges, and individuals are researched and answered as they are received. Inquiries from the R.I. Development Council, the State Librarian, the Providence Journal-Bulletin, The Department of Agriculture and Conservation and others for mimeo reports and Bulletin 378, 'One Hundred Years of Rhode Island Agriculture - Statistics and Trends' published in 1965 are frequent. The latest Census data is included each year in Statistics on R.I. Agriculture and is used extensively by county agents and others mentioned above. Crop reports on livestock, crops, acreage are all furnished to interested people.

SUPPORTED BY Rhode Island State Government

2.0084, TRAVEL IN ARKANSAS - AN ECONOMIC ANALYSIS

L.C. COPELAND, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916

The purpose of this research is to measure the volume and trends of travel for all purposes, both within the area and from other states. The primary emphasis is on the economic impact of travel-related activities and the several types of business that have arisen to serve the needs of the traveling public and to transport travelers.

The research begins with the characteristics of travelers, who are defined as persons away from home outside their commuting zone during the day or overnight, their origin and destination, their activities in the area, and the market created by their demands. Travel is measured in terms of the number of persons, parties, and vehicles; intercity passenger miles traveled, and their expenditures for various items.

The volume and trends of travel are analyzed in relation to the facilities for lodging, eating, and recreation; auto and gasoline services; and passenger transportation via railroad, plane, and bus. Business activities associated with travel are measured in terms of volume of sales and receipts, firms at the service of travelers, employment in and income and tax revenues derived from the travel serving business.

SUPPORTED BY Arkansas State Government

2.0085, KNOXVILLE ANNUAL TOURIST SURVEY

L.C. COPELAND, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916

The purpose of this research is to measure the volume and trends of travel for all purposes, both within the area and from other states. The primary emphasis is on the economic impact of travel-related activities and the several types of business that have arisen to serve the needs of the traveling public and to transport travelers.

2. ECONOMICS

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SUPPORTED BY Knoxville City Government - Tennessee

2.0086, TOURISTS AND ALABAMA BUSINESS - AN ECONOMIC ANALYSIS

L.C. COPELAND, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916

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SUPPORTED BY Alabama State Government

2.0087, TRAVEL IN IOWA - AN ECONOMIC ANALYSIS

L.C. COPELAND, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916

The purpose of this research is to measure the volume and trends of travel for all purposes, both within the area and from other states. The primary emphasis is on the economic impact of travel-related activities and the several types of business that have arisen to serve the needs of the traveling public and to transport travelers.

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SUPPORTED BY Iowa State Government

2.0088, THE KANSAS CITY TOURIST TRADE - AN ECONOMIC ANALYSIS

L.C. COPELAND, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916

The purpose of this research is to measure the volume and trends of travel for all purposes, both within the area and from other states. The primary emphasis is on the economic impact of travel-related activities and the several types of business that have arisen to serve the needs of the traveling public and to transport travelers.

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SUPPORTED BY Kansas City Government - Kansas

2.0089, SURVEY OF TRAVEL IN KENTUCKY: AN ECONOMIC ANALYSIS

L.C. COPELAND, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916

The purpose of this research is to measure the volume and trends of travel for all purposes, both within the area and from other states. The primary emphasis is on the economic impact of travel-related activities and the several types of business that have arisen to serve the needs of the traveling public and to transport travelers.

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SUPPORTED BY Kentucky State Government

2.0090, TOURISTS AND THE TRAVEL BUSINESS IN LOUISIANA - AN ECONOMIC ANALYSIS

L.C. COPELAND, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916

The purpose of this research is to measure the volume and trends of travel for all purposes, both within the area and from other states. The primary emphasis is on the economic impact of travel-related activities and the several types of business that have arisen to serve the needs of the traveling public and to transport travelers.

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SUPPORTED BY Louisiana State Government

2.0091, TRAVEL IN MISSISSIPPI - AN ECONOMIC ANALYSIS

L.C. COPELAND, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916

The purpose of this research is to measure the volume and trends of travel for all purposes, both within the area and from other states. The primary emphasis is on the economic impact of travel-related activities and the several types of business that have arisen to serve the needs of the traveling public and to transport travelers.

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SUPPORTED BY Mississippi State Government

2.0092, NORTH CAROLINA TRAVEL SURVEY - AN ECONOMIC ANALYSIS

L.C. COPELAND, Univ. of Tennessee, School of Business Admin., *Knoxville, Tennessee* 37916

The purpose of this research is to measure the volumes and trends of travel for all purposes, both within the area and from other states. The primary emphasis is on the economic impact of travel-related activities and the several types of business that have arisen to serve the needs of the traveling public and to transport travelers.

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SUPPORTED BY North Carolina State Government

2.0093, THE TRAVEL BUSINESS IN LOUISVILLE, KENTUCKY

L.C. COPELAND, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916

The purpose of this research is to measure the volume and trends of travel for all purposes, both within the state and from other states. The primary emphasis is on the economic impact of travel-related activities and the several types of business that have arisen to serve the needs of the traveling public and to transport travelers.

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SUPPORTED BY Louisville City Government - Kentucky

2.0094, TOURISTS AND THE TRAVEL BUSINESS IN OKLAHOMA - AN ECONOMIC ANALYSIS

L.C. COPELAND, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916

The purpose of this research is to measure the volume and trends of travel for all purposes, both within the area and from other states. The primary emphasis is on the economic impact of travel-related activies and the several types of business that have arisen to serve the needs of the traveling public and to transport travelers.

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SUPPORTED BY Oklahoma State Government

2.0095, THE TENNESSEE TOURIST TRADE - AN ECONOMIC ANALYSIS

L.C. COPELAND, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916

The purpose of this research is to measure the volume and trends of travel for all purposes, both within the area and from other states. The primary emphasis is on the economic impact of travel-related activities and the several types of business that have arisen to serve the needs of the traveling public and to transport travelers.

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SUPPORTED BY Tennessee State Government

2.0096, THE SOUTH CAROLINA TRAVEL TRADE - AN ECONOMIC ANALYSIS

L.C. COPELAND, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916

The purpose of this research is to measure the volume and trends of travel for all purposes, both within the area and from other states. The primary emphasis is on the economic impact of travel-related activities and the several types of business that have arisen to serve the needs of the traveling public and to transport travelers.

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SUPPORTED BY South Carolina State Government

2.0097, THE TRAVEL BUSINESS IN THE SOUTHEAST (ELEVEN STATES)

L.C. COPELAND, Univ. of Tennessee, Graduate School, *Knoxville, Tennessee* 37916

The purpose of this research is to measure the volume and trends of travel for all purposes, both within the state and from other states. The primary emphasis is on the economic impact of travel-related activities and the several types of business that have arisen to serve the needs of the traveling public and to transport travelers.

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SUPPORTED BY Southern Directors Council

2.0098, AN ANALYSIS OF THE ECONOMIC AND SOCIAL BENEFITS OF THE PROPOSED EXPANSION OF NORRIS DAM STATE PARK

P.R. LOWRY, Memphis State University, Bureau of Bus. & Econ. Res., *Memphis, Tennessee* 38111

A study of the benefits of a proposed program of $3,700,000 of construction of lodging, camping and recreational facilities in the Norris Dam State Park in a three-county area affected by the park improvements.

SUPPORTED BY Tennessee State Government

2.0099, EFFICIENCY OF SELECTED GRAZING SYSTEMS, RESEARCH

W.C. BROWNLEE, State Parks & Wildlife Dept., *Austin, Texas* 78701

Objective: To develop and demonstrate methods of maintaining optimal productivity of range land, suitable with the land manager's desire of maximum monetary return and the hunter's desire of maximum available game.

Procedures: Livestock production records will be kept on individual animals to facilitate a statistical analysis of the data. These records will include weight of offspring, weight of wool or mohair and other comparative quality indicators. Deer production will be measured in terms of animals harvested by hunters from the grazing systems. Deer population density, doe to fawn ratios, buck to doe ratios, and number of surplus animals will be computed from data obtained from a walking cruise method.

During this period the major consideration will be one of adequate harvest to insure moderate grazing by deer. The deer to be removed will be harvested by a controlled hunt in which the public participates. Number of deer killed, sex, and antler development will be recorded.

A group of vegetative measurements techniques utilized since the beginning of the experimental grazing systems will be continued for comparative purposes. The techniques are described in special report, W-76-8. Four types of measurements are made to record browse utilization, ground cover composition, and sequence of forage use in pastures containing livestock.

Records of the income and expenses associated with the livestock operation on the Kerr Area will be maintained by the lessee. From these records will be computed a net return per animal unit for each grazing system. A simulated net return per animal unit of deer will be computed by using average income prices on deer derived from ranch survey information. Cost of pasturage will be computed by multiplying the deer population estimates by the price paid by the lessee for each animal unit of livestock. Gross income will be computed by multiplying the average price per deer by the number of animals killed during the harvest.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

2.0100, THE GROWTH AND DEVELOPMENT OF MUNICIPAL PARK AND RECREATION DEPARTMENTS IN THE STATE OF TEXAS FROM 1940 TO 1969

J.S. WILLIAMS, Texas A & M University System, Graduate School, *College Station, Texas* 77843

The main objective of this study is to document, for the first time, the growth of municipal park and recreation departments in the State of Texas. A direct mail questionnaire will be utilized to obtain data from all of the Texas cities having organized recreation and park departments. In addition, a small selection of park operations under unorganized official departments will be investigated. The information sought for each year includes: history of managers, budgets, capital outlay, bond issues, revenues, contributions, numbers and sizes of parks, method of land acquisition, personnel, supervised and unsupervised playgrounds, cemeteries, and projections of growth to 1975. The data will be analyzed to determine trends and will be classified by city size, park size, and management pattern.

SUPPORTED BY Texas A. & M. University System

2.0101, THE RECREATIONAL VALUE OF WATER FOR WATERFOWL PRODUCTION

J.B. LOW, Utah State University, State Coop. Wildlife Res. Unit, *Logan, Utah* 84321

We have the constant problem of placing a monetary value on waterfowl refuges proposed for inclusion as an integral part of Federal multiple purpose water resource projects. As various users place greater pressure on existing water supplies, it becomes increasingly more important to allocate water in an equitable manner. The problem of finding some optimum allocation of water is a difficult one. It is made difficult primarily due to the fact that many uses of water do not have market values which can readily be placed in some kind of benefit-cost analysis. This is particularly true of recreation uses.

Increasing attention to valuing recreation has been paid by researchers in recent years. Models have been developed for valuing on- site use of recreation resources. Placing a value on water used in waterfowl refuges and game management areas raises some unique problems, however, in that many of the benefits are widely dispersed in time and place. The marsh may provide food, cover, and a resting place for migrants, but only a portion of the recreation benefit is received at the site of the refuge.

The primary objective of this research is to develop and test methods that can be used for valuing on-site and off-site benefits originating from the production of waterfowl at selected Utah waterfowl refuges and state marshes. Information gathered from questionnaire returns and personal interviews is being used to: 1. Define and describe the various contributions (both positive and negative) of waterfowl to society's welfare. 2. Develop and employ methods of empirically measuring (in dollars) the most important of these contributions. 3. Relate the diverse values to water levels and waterfowl production at existing Utah marshes.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

2.0102, OPERATION AND MANAGEMENT OF YOUTH CAMPS

M.I. BEVINS, Univ. of Vermont, Agricultural Experiment Sta., *Burlington, Vermont* 05401 (VT00161)

OBJECTIVE: Conduct a basic descriptive study of the operation and management of a selected group of resident youth camps (both institutional and private) in Vermont. Collect financial data in sufficient detail to prepare comparative operating statements and balance sheets relating to 1966 operations. Study the financial implications associated with the continuation of youth camp operations as opposed to commercial uses of land and water resources or public development for recreation. Investigate the importance of factors that might affect youth camp participation.

APPROACH: During the spring of 1966, conduct a mail survey of camp operators to determine basic descriptive information relating to camp operation and management.

PROGRESS: Camps were divided into two groups--60 private and 30 institutional camps. The youth camp industry in the state is not new-- those studied had been in business an average of 30 years. The size of individual camps increased approximately 90 percent 1950-1960. The trend toward larger camps continued 1960 through 1965. The average private camp was using 256 acres for recreational purposes, the average agency camp 185 acres. In addition to private lands, public recreation areas represented a major contribution to the total land package in use. Public recreation areas were used primarily for camping and hiking. Operators felt that further development of public campgrounds should be given a number one priority rating followed by hiking trails. Average operating income for private camps was $55,619 or approximately $600 per camper for an 8-week season. Labor, taxes, insurance, and advertising represented major operating costs. Thirty-eight percent of the group operated the camp at a loss in 1965 while 18 percent of private camps had a profit of $10,000 or more for the season. Losses were most evident in the small camp group (less than 300 camper weeks). A correlation was found between size and profitability of operations.

SUPPORTED BY U.S. Dept. of Agriculture

2.0103, ECONOMIC ANALYSIS OF THE CAMPGROUND MARKET IN THE NORTHEAST

M.I. BEVINS, Univ. of Vermont, Agricultural Experiment Sta., *Burlington, Vermont* 05401

To determine the motivations, goals, and characteristics of the camping public as a guide to development of a rational pricing system of public and private camping resource mix.

To determine the legal authority and policies which underlie the pricing and marketing decisions of public camping management agencies.

To determine the marketing and pricing practices of private firms providing camping.

To develop and evaluate alternative marketing and pricing systems in accordance with expressed goals of the general public, campground users, private firms, and public camping management agencies.

SUPPORTED BY U.S. Dept. of Agriculture

2.0104, NONRESIDENT OWNERSHIP OF PROPERTY IN VERMONT

R.O. SINCLAIR, Univ. of Vermont, School of Agriculture, *Burlington, Vermont* 05401

This study has involved an economic analysis of all nonresident owners of properties of 3 or more acres in a 30 town sample. Nonresident owners include both out-of-staters, and residents of Vermont who own property in a town other than their place of permanent residence. A major share of these properties are vacation homes.

The research involved socioeconomic profiles of owners as well as descriptions of the properties. Also studied were such factors as use, income from property, satisfactions with level of services, desires for additional services, etc.

SUPPORTED BY University of Vermont

2.0105, STUDIES IN RURAL LAND USE

R.O. SINCLAIR, Univ. of Vermont, Agricultural Experiment Sta., *Burlington, Vermont* 05401 (VT00172)

OBJECTIVE: Determine procedures for evaluating changes in land uses; analyzing present land use in rural areas. Evaluate relative effectiveness of aerial photos versus field surveys. Determine changes in land use from farm to non-farm effects on tax base, open lands, land values need for highways. Assist local planning groups in developing procedures for determining present and potential land use.

APPROACH: Analyze changes in land use from two sets of aerial photographs and maps with recent information.

PROGRESS: A preliminary property ownership and land use map for the town of Williston has been prepared. Several techniques in mapping have been experimented with in an attempt to find a method that might be adaptable to laymen members of planning commissions or other town groups. A report is being prepared outlining methods of analysis and mapping of land use. An analysis of sales of land in lots of one acre or more is being made in 32 towns in the state. Attempts are being made to measure effects of recreation developments, nearness to urban centers, proximity to the interstate, past and proposed land use, and other factors on land prices. Data on land prices are being obtained for the 1958-60 and 1964-66 periods.

SUPPORTED BY U.S. Dept. of Agriculture

2.0106, EFFECTS OF RESERVOIR OPERATING POLICY ON RECREATION BENEFITS

P.H. KING, Virginia Polytechnic Institute, School of Engineering, *Blacksburg, Virginia* 24061

Quantitative guidelines for evaluating the effect of reservoir drawdowns on recreational uses of impounded water will be developed. Field data will be collected to assess the result of selected operating policies on such variables as total attendance, average length of stay, average expenditures and extent of specific recreational activities such as camping, boating, swimming, water skiing and fishing. Various traditional methods of benefit analysis will be utilized as a basis of quantifying incremental costs and benefits associated with incremental changes in water surface level. The effect of water level fluctuation will be determined in terms of specific visitor-day allowances. The results of the research will provide quantitative data for the water resources planner who utilizes economic data and systems analysis techniques to develop optimal operating policies for a multiple purpose water resources project.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

2.0107, THE ECONOMIC IMPACT OF RURAL RECREATIONAL ENTERPRISES

R.A. CHRISTIANSEN, U.S. Dept. of Agriculture, Natural Resources Econ. Div., *Madison, Wisconsin* 53711 (NRE7-2-52 01)

OBJECTIVE: Locate and classify private rural recreational enterprises in Wisconsin; assemble and analyze economic information about them relative to their income-producing abilities and possible institutional problems peculiar to recreation enterprises; and evaluate by recreational regions the extent and potential for farmland conversion to private recreational uses and the effect of recreational development on regions of the State.

APPROACH: A sample of recreational enterprises will be drawn from the inventory of rural private recreational businesses in Wisconsin, and economic analyses will be made based on information from the sample. The analyses will follow budgeting procedures wherever possible but also will consider input-output factors, allocations of resources between recreation and other uses, problems peculiar to recreation businesses, operator characteristics, problems associated with management, and the factors of demand distribution and enterprise location as they affect opportunities. Research is carried out by a team consisting of ERS and Experiment Station staff (see NRE 5-2-52-01-X1).

PROGRESS: Five studies of recreation enterprises were published in cooperation with the University of Wisconsin. These included analyses of cabin resorts, vacation farms, campgrounds, riding stables and shooting preserves. In general, the enterprises studied were too small for economically efficient family sized operation. Many are part-time or retirement activities for the operators. Short seasons, inadequate facilities and services, variable demand for services, and excessive unit costs of operation contributed to the relatively low returns to management and capital. Location was important. Cabin resorts were located in northern recreation areas noted for fishing and related activities; while riding stables, shooting preserves and vacation farms were concentrated closer to population centers. More than half of the private campground operators stated that nearby non-campground facilities, whether publicly or privately owned, were an asset to their business. Competition from public facilities was thought to be less important by operators of other types of enterprises.

SUPPORTED BY U.S. Dept. of Agriculture

2.0108, ECONOMIC AND LEGAL FACTORS IN PROVIDING, USING AND MANAGING WATER

R.J. PENN, Univ. of Wisconsin, Agricultural Experiment Sta., *Madison, Wisconsin* (WIS01212)

OBJECTIVE: Determine the economic considerations that affect use and management of water, identify and describe rights in water and arrangements that regulate water use.

APPROACH: Multiple regression analysis of data collected from 60 artificial lakes in Wisconsin and an analysis of consumer behavior relating recreation to selected characteristics. Update an existing bibliography of publications concerning water rights and related topics. Provide a method to measure economic effects of state and federal water- based recreation projects on the economies of local political subdivisions; and illustrate the use of the model to analyze the adequacy of present and proposed public decision-making institutions relating to the development and expansion of water based recreation areas.

PROGRESS: The research on property values of artificial lakes has been completed. It will be published as a report of the Department of Agricultural Economics of the University of Wisconsin. Extracts from this report will appear in Water Resources Research and Land Economics. Other work on the project has been suspended as the Principal Investigator is on leave for the year. Work for the next year will proceed along two lines. One is that further work will be done on the study of Wisconsin vacationers. In addition, new studies on the benefits of recreational and hydroelectric power generation uses of the Wisconsin River are being developed. They will contribute to a larger interdisciplinary study concerned with water quality management systems for this river basin.

SUPPORTED BY U.S. Dept. of Agriculture

2.0109, THE ECONOMIC IMPACT OF RURAL RECREATIONAL ENTERPRISES

S.D. STANIFORTH, Univ. of Wisconsin, Agricultural Experiment Sta., *Madison, Wisconsin* (NRE5-2-52-01-X1)

OBJECTIVE: Locate and classify private rural recreational enterprises in Wisconsin; assemble and analyze economic information about them relative to their income-producing abilities and possible institutional problems peculiar to recreation enterprises; and evaluate by recreational regions the extent and potential for farmland conversion to private recreational uses and the effect of recreational development on regions of the State.

APPROACH: A sample of recreational enterprises will be drawn from the inventory of rural private recreational businesses in Wisconsin, economic analyses will be made based on information from the sample. The analyses will follow budgeting procedures wherever possible but also will consider input-output factors, allocations of resources between recreation and other uses, problems peculiar to recreation businesses, operation characteristics, problems associated with management, and the factors of demand distribution and enterprise location as they affect opportunities. Research is carried out by a team consisting of ERS and Experiment Station staff (see NRE 5-2-52-01).

PROGRESS: Approximately 375 useable questionnaries covering samples for 10 types of recreation enterprises were collected and were programmed for analysis by graduate students. Several short reports for specific enterprises were prepared for Extension use. Leadership was provided to other graduate students developing assignments related to the recreation research project.

SUPPORTED BY U.S. Dept. of Agriculture

2.0110, LAKE PROPERTY OWNERS ASSOCIATIONS: EFFECTIVENESS

D.A. YANGGEN, Univ. of Wisconsin, School of Agriculture, *Madison, Wisconsin*

The purpose of the study is to investigate the role that lake property owners associations play in managing Wisconsin lakes. Questionnaires mailed to members of lake property owners associations will be summarized and analyzed.

Summary and analysis of the questionnaires will consist of two basic types. The first is descriptive and will consist of information such as the name, location and size of lake; number of members of the association, the percentage of property owners, who are members and the percentage who are seasonal residents; lake problems perceived by association members; and activities conducted to solve these problems by the association, town government, county government, state government, private individuals, sanitary districts and other groups.

The second part of the analysis will look at the correlation between the activities of the association and such factors as size of lake, percentage of seasonal residents, membership in the Federation of Wisconsin Lake Property Owners and other relevant factors.

SUPPORTED BY U.S. Dept. of Commerce - Up. Gr. Lks. Com.

2.0111, HUNTING AND FISHING VALUES IN WYOMING; 1970

F. DOLL, Univ. of Wyoming, School of Commerce, *Laramie, Wyoming* 82070

The general objective of this study is to develop economic information needed by wildlife managers for their planning and development functions. Specific objectives will be as follows: 1. For major fish and game species information will be developed to determine: a. Extent of resident and non-resident participation (percent of population, number of trips, number of days) b. Expenditures c. Demographic characteristics (income, age, sex, education, place of residence, occupation, etc.) of resident and non-resident hunters and fishermen d. Determine the economic value of a selected wildlife species or game herd. 2. Identify and describe attitudes toward hunting and fishing in relation to the following areas: a. Non-economic values of hunting and fishing (motivational and esthetic values, etc.) b. Reasons for non-participation by Wyoming residents c. Private landowners allowing access for hunting and fishing d. Institutional restrictions to hunting and fishing (restricted access, trespass fees, guide requirements, etc.) e. Information needs of resident and non- resident hunters and fishermen (regulation best hunting and fishing areas, locational maps, directional signs, road and water conditions).

SUPPORTED BY Wyoming State Government

2.0112, HUNTING AND FISHING VALUES IN WYOMING; 1970

C. PHILLIPS, Univ. of Wyoming, School of Commerce, *Laramie, Wyoming* 82070

The general objective of this study is to develop economic information needed by wildlife managers for their planning and development functions. Specific objectives will be as follows: 1. For major fish and game species information will be developed to determine: a. Extent of resident and non-resident participation (percent of population, number of trips, number of days). b. Expenditures. c. Demographic characteristics (income, age, sex, education, place of residence, occupation, etc.) of resident and non-resident hunters and fishermen. d. Determine the economic value of a selected wildlife species or game herd. 2. Identify and describe attitudes toward hunting and fishing in relation to the following areas: a. Non-economic values of hunting and fishing (motivational and esthetic values, etc. b. Reasons for non-participation by Wyoming residents. c. Private landowners allowing access for hunting and fishing. d. Institutional restrictions to hunting and fishing (restricted access, trespass fees, guide requirements, etc.) e. Information needs of resident and non- resident hunters and fishermen (regulation best hunting and fishing areas, locational maps, directional signs, road and water conditions).

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

2.0113, ECONOMIC AND LEGAL ASPECTS OF LIMITING LIABILITY WHEN PRIVATE PROPOERTY IS USED FOR OUTDOOR RECREATION

W.D. SCHUTZ, Univ. of Wyoming, Agricultural Experiment Sta., *Laramie, Wyoming* 82071

Six cooperating Great Plains States - Colorado, Texas, North Dakota, Nebraska, Oklahoma. and Wyoming, undertook this study: (1) To provide information on economic and legal risks incurred by a possessor of private property when the property is used by others for recreational purposes, and (2) To determine methods of reducing liability risks available to a property owner and costs thereof.

The first part of the study treating legal liability has been completed, and a publication titled 'Legal Liability and Its Limitation When Private Property is Used for Outdoor Recreation' should soon be in print.

Data gathered on the second question were deemed insufficient for answering the question, and the decision has been made to gather more information before attempting a report. The additional data will be supplied to Nebraska where preparation of the report is to be accomplished.

SUPPORTED BY University of Wyoming

DESCRIPTION OF RESEARCH TASKS

3. USER STUDIES

Participants in Outdoor Recreation: Their Attitudes, Performance and Other Characteristics

3.0001, FOREST RECREATION DEMAND ANALYSIS
D.A. KING, Univ. of Arizona, Agricultural Experiment Sta., *Tucson, Arizona* 85721 (ARZT-9020-240-620)

OBJECTIVE: Estimation of forest recreation demand relationships and development of recreational use forecasting models. Development of better methods for evaluating forest recreation areas.

APPROACH: Studies aimed at improved definition of recreation products, starting with auto camping, will attempt to combine user and resource characteristics to develop a classification scheme reasonable to the user and the administrator. Eventually included will be user motives in addition to commonly measured socioeconomic characteristics. Then the demand relationships will be studied to provide information for better projections of use. The travel-cost method will be used, with development of needed adaptations as part of the work to be done. This may include recognition of differing incomes, tastes, and opportunity costs of time among users.

SUPPORTED BY U.S. Dept. of Agriculture

3.0002, COOPERATIVE AGREEMENT FOR BEAVER RESERVOIR CREEL CENSUS STUDY
T.O. DUNCAN, U.S. Dept. of Interior, Bur. of Sport Fish. & Wildlife, *Fayetteville, Arkansas* 72701

Plan of Work: To study angler's catch, effort, and related factors during impoundment of Beaver Reservoir. A cooperative program.

Objective: To estimate: (1) sport fishing harvest as numbers and pounds of fish by species per acre for each season of the census year; (2) fishing success in numbers and pounds by species per angler-hour; and (3) total harvest and effort.

Procedure: Estimates of fishing pressure to be obtained by the progressive count method using observations from aerial flights. Fishing success estimated by fisherman interviews. Harvest estimates based on information obtained from fisherman's catch. Traffic data counts will be used in comparison of boat and aerial counts.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0003, TO DEVELOP NEW KINDS OF FAMILY PLAY CENTER IN VACANT LOTS
UNKNOWN, People Pledg. For Comm. Prog. , *California*

No summary has been provided to the Science Information Exchange.

SUPPORTED BY Rosenberg Foundation - San Francisco, Cal.

3.0004, CAMPGROUND LENGTH-OF-STAY/LIMIT-OF-STAY ANALYSIS
G.H. ELSNER, U.S. Dept. of Agriculture, Pac. Sw. For. & Rg. Expt. Sta., *Berkeley, California*

Estimation of the hypothetical result of alternative maximum limits-of-stay on total amount of usage and total number of users at selected campgrounds.

SUPPORTED BY U.S. Dept. of Agriculture

3.0005, FREQUENCY COMPUTATIONS FOR VISUAL ANALYSIS STUDIES
G.H. ELSNER, U.S. Dept. of Agriculture, Pac. Sw. For. & Rg. Expt. Sta., *Berkeley, California*

To review procedure for computer delineation of visible areas and design and test a procedure for computing the frequency with which terrain cells are visible from a road.

Develop and test a winter sports site use simulation model to estimate annual level of use and market area for proposed large winter sports sites in California.

SUPPORTED BY U.S. Dept. of Agriculture

3.0006, ENVIRONMENTAL EDUCATION SEMINARS
M.M. MENESINI, Educ. Consulting Service, *Orinda, California* 94563

A survey by confrontation of problems related to environmental education in three localities: Boston Area, Greater San Francisco Bay Area, and Chicago Area.

Goals: 1. To give all students, including the culturally different, the disadvantaged, the exceptional, and the handicapped, an opportunity to develop an environmental awareness through education. 2. To provide and coordinate environmental/ecological education ideas for the curricula. 3. To develop operational or logistical skills so that participants could implement environmental education programs. 4. To provide a platform for discussion and understanding of the term 'environmental education.' 5. To exchange information about what is needed to implement environmental education, the specific obstacles which prevent implementation, and what problem solutions have been tried.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - Off. Ed.

3.0007, NATIONAL ENVIRONMENTAL EDUCATION DEVELOPMENT (NEED)
M.M. MENESINI, Educ. Consulting Service, *Orinda, California* 94563

Basic to the NEED program is the premise that environmental awareness requires outdoor implementation of classroom lessons, which must be related to all subjects in the curriculum: to art, literature, social studies, as well as the natural sciences. Materials are being created for pre-site (classroom), on-site (environmental school), and post-site follow-up.

Phase I of the NEED program emphasizes the appreciative level in an encounter with natural phenomena at an environmental school site, with emphasis on academic, aesthetic, and skill interpretations. This phase focuses on elementary-school levels.

Phase II for the intermediate (7th, 8th, 9th grades) level of the program centers on man's positive and negative utilization of his natural resources, and his efforts to rectify a self-imposed contaminated environment through technological applications.

Phase III (high school) will develop the necessity for environmental ethics, centered on attitudes of the individual. It will integrate the disciplines of political science, economics, and sociology.

SUPPORTED BY National Park Foundation - Washington

3.0008, CONSUMER CHARACTERISTICS, SATISFACTIONS AND USE AT DAVIS CREEK CAMPGROUND

T.A. STILLE, San Jose State College, Graduate School, *San Jose, California* 95114

It is the purpose of this study to identify and analyze consumer characteristics, satisfactions and use at Davis Creek Park.

Sub-problems were: (1) to determine the origin, group size and income of camping consumers, (2) to identify and analyze the reactions of participants to rules and regulations, physical facilities, natural environment, fees, and park personnel, and (3) to analyze camper use in terms of length of stay, number of visits per year and campsite selection.

Two minor problems were: (1) to estimate a demand curve in terms of user days and distance traveled, and (2) to ascertain consumer preferences as to the locations of additional camping areas to be developed in Washoe County, Nevada.

SUPPORTED BY Nevada State Government

3.0009, PARK USER SURVEYS AT MANITOBA PROVINCIAL PARKS AND RECREATION AREAS (ABBREV)

N. NIXON, Manitoba Dept. of Tour. & Rec., *Winnipeg - Manitoba, Canada*

The surveys are undertaken as part of the Canada Outdoor Recreation Demand (CORD) Study and are designed to indicate the type of visitors using Manitoba Provincial Parks and Recreation Areas. Information to be gathered in the surveys includes: orgin or the visitors, their length of stay in the area, the activities they engage in, and socio-economic details such as income, age, education and occupation. Analysis of the data will be undertaken by a central agency (National and Historic Parks Branch, Ottawa) in conjunction with survey data generated by identical surveys undertaken in the other province of Canada.

SUPPORTED BY Manitoba Provincial Government

3.0010, THE MANITOBA SKIER MARKET

N. NIXON, Manitoba Dept. of Tour. & Rec., *Winnipeg - Manitoba, Canada*

The study was designed to indicate the market area of two major ski resorts in the Province of Manitoba. Throughout the 1968-69 skiing season a record was maintained of the licenses of all vehicles using the parking lots at the Mt. Agassiz and Falcon Lake Ski Areas. Through the use of a computer program written for the Manitoba Department of Transport it is possible to determine the registered address of each licensed vehicle, in terms of city or town for the rural areas and the postal zone for Metropolitan Winnipeg. Regression analyses were run on the number of visits generated by each town or postal zone, and several variables including: distance to the ski area, the number of persons reporting incomes greater than $10,000 and greater than $7,000 the number of persons in professional, technical and managerial occupations, the lift capacity of the ski area divided by the distance to the ski area, and the number of males in the population between the ages of 20 and 34. The study will be continued at several additional areas in the 1969-70 season.

SUPPORTED BY Manitoba Provincial Government

3.0011, PROVINCIAL PARKS-WHITESHELL, GRAND BEACH, GRASS RIVER, DUCK MT., ST. MALO, ST. AMBROISE, PATRICIA BEACH AND NORQUAY. (ABBREV)

N. NIXON, Manitoba Dept. of Tour. & Rec., *Winnipeg - Manitoba, Canada*

The survey is undertaken within the scope of the Canada Outdoor Recreation Demand (CORD) Study and is designed to indicate the type of visitors using Manitoba Provincial Parks and Recreation Areas. Information to be gathered by the study includes: origins of the visitors, their length of stay in the area, the activities they take part in, and socio-economic details such as income, age, and education level. Analysis of the data will be undertaken by a Central Agency (National and Historic Parks Branch, Ottawa) in conjunction with survey data generated by identical surveys undertaken in the other 9 Canadian provinces.

SUPPORTED BY Manitoba Provincial Government

3.0012, SURVEY OF VISITORS TO MANITOBA TOURIST RECEPTION CENTERS

G.D. TAYLOR, Manitoba Dept. of Tour. & Rec., *Winnipeg - Manitoba, Canada*

The study is undertaken in order to indicate the pattern in which visitors to Manitoba distribute themselves throughout the province. Information will be gathered by means of short questionnaires completed by visitors to the Tourist Reception Centers. The data will indicate the origins of the visitors, their length of stay in Manitoba, their destination in the province, and the activities and facilities they will be looking for during their stay. Through analysis of the data on the basis of the visitors' destinations and interests it should be possible to indicate the tourist market for each of the 5 tourist regions within the province.

SUPPORTED BY Manitoba Provincial Government

3.0013, MANITOBA RECREATION SURVEY

G.D. TAYLOR, Manitoba Dept. of Tour. & Rec., *Winnipeg - Manitoba, Canada*

As an input to the Manitoba Provincial Recreation and Tourist Development Plan a major survey of the recreation and travel activities of Manitobans will be conducted in the fall of 1970. All aspects of the recreational use of leisure time and particularly those activities involving travel will be covered in the survey.

SUPPORTED BY Manitoba Provincial Government

3.0014, PROSPECTIVE LEVELS OF RECREATION ACTIVITIES IN THE SOURIS BASIN, MANITOBA-PROJECTIONS FOR 1980 AND 1990

R.E. CAPEL, Univ. of Manitoba, School of Agriculture, *Winnipeg - Manitoba, Canada*

Projections will be made of the numbers of day-users of recreational facilities in 1980 and 1990 at the proposed Antler Creek and Gainsborough Creek reservoirs. To do this, projections will be made of participation rates of the relevant population in major outdoor recreation activities. Estimates will then be made, using available economic base studies, of how the 1980 and 1990 populations will allocate recreation activities between the reservoirs in question and competing facilities in Manitoba and adjacent regions.

Postal surveys of recreation behavior have been carried out, and the responses are now being analysed. Both urban and rural areas were sampled. Questions related to family characteristics, ownership of recreation equipment, and direction, distance, and frequency of travel to outdoor recreation. Rural areas were selected to sample populations exposed to newly established versus older parks--to examine the time taken by people to learn about new facilities and activities.

Work has been completed on an employment-shift analysis of population in Manitoba and parts of North Dakota and Saskatchewan. The results will be used as projections of potential populations of people who might engage in outdoor recreation.

SUPPORTED BY Canadian Government - Ottawa

3.0015, A SUPPLY-DEMAND ANALYSIS OF CAMPING IN MANITOBA

R. HO, Univ. of Manitoba, *Winnipeg - Manitoba, Canada*

This thesis will primarily be based on the methods of the Park and Recreation Information System for California with necessary alterations for application to Manitoba. The purpose of this study is to determine the demand for camping in Manitoba and the supply facilities which are available at present. The results and conclusions from the supply and demand schedules will be used to formulate a pattern for potential demand of this recreational activity.

SUPPORTED BY University of Manitoba

3.0016, ONE-DAY TRIPS BY METROPOLITAN WINNIPEG RESIDENTS TO PUBLIC NON-URBAN RECREATION SITES - PREDICTION SYSTEMS ANALYSIS (ABBREV)

P.J. LOCKETT, Univ. of Manitoba, *Winnipeg - Manitoba, Canada*

Using information obtained from the Canadian Outdoor Recreation Demand Study, an analysis of the situation in 1969, within the 'excursion zone' around Metropolitan Winnipeg is being undertaken. Prediction of activity participation rates to 1990 will be produced by the application of the program RECSYS, developed at Michigan University, 1966, and the program for Cut-Sets of Highways developed at Waterloo University, 1966.

SUPPORTED BY University of Manitoba

3.0017, CONSUMER ANALYSIS FOR SPECIFIC FOREST-ORIENTED RECREATIONAL ACTIVITIES IN THE NORTHEAST

W.C. MCKAIN, Univ. of Connecticut, Agricultural Experiment Sta., *Storrs, Connecticut* 06268 (CONS00339)

OBJECTIVE: Identify and analyze those social, psychological and economic variables which motivate consumers to participate in outdoor recreational activites.

APPROACH: By means of library research and correspondence an inventory of relevant research and a classification of hikers will be developed. Mailed questionnaires and personal interviews will be used to obtain information regarding hikers and hiking clubs in New England (characteristics of members, areas of activity, etc.). On the basis of this information, hypotheses regarding the motivation of the participants will be set forth.

PROGRESS: Approximately 1100 replies from questionnaire mailed to members of the Green Mountain Club are being coded for tabulation. A schedule of information to be obtained by personal interview is being prepared.

SUPPORTED BY U.S. Dept. of Agriculture

3.0018, INVESTIGATION AND ANALYSIS OF FLOODS FROM SMALL DRAINAGE AREAS IN OHIO

W.P. CROSS, U.S. Dept. of Interior, Geological Survey, *Washington, District of Columbia* 20242 (2R23)

The existing program of flood studies and analyses are being supplemented to obtain an adequate measure of flood characteristics for drainage areas of less than one square mile by using additional high stage indicators (pipes).

Document provided by Highway Research Information Service.

SUPPORTED BY U.S. Dept. of Transportation - Public Rds.

3.0019, MEASUREMENT OF AESTHETIC APPEAL OF MANAGED FOREST AND WILD LAND ROADSIDE ENVIRONMENTS

K.R. SWINFORD, Univ. of Florida, Agricultural Experiment Sta., *Gainesville, Florida* 32601 (WO1903)

OBJECTIVE: To develop procedures for the objective rating of the aesthetic response quality level of forest and other rural landscapes, and contribute to existing knowledge of human awareness of and reaction to prescribed modifications of roadside environments in managed forests and wild lands.

APPROACH: Investigate the use of color motion picture and/or slide sequences for sampling user opinion of the aesthetic qualities of forest landscape. Sample the response of various selected population groups to the filmed sequences developed during the preceding phase. Evaluate various modifications of commercial forest harvesting operations and partial cuttings in buffer zones or screening strips along road right- of-ways from the standpoint of their amelioration of the aesthetically displeasing appearance of the usual cutover residual stand.

PROGRESS: Through the application of research supported theories in psychology, design and environmental ecology, major problems have been defined, and a three-part predictive classification system for roadside scenery has been developed. Appropriate scenes representing the majority of the classes of the system have been photographed and the slides have been assembled into a preference test series. These will be presented to randomly selected audiences within the next few months. Arrangements have been made to use small groups of tourists (8 to 10 adults at a time) at nine different welcome stations located just within the state boundary on major highways for testing. We also plan to test these materials through sampling Florida residents who will be attending two separate conservation group meetings and the University of Florida Homecoming program.

SUPPORTED BY U.S. Dept. of Agriculture

3.0020, DAM OF VINCA

UNKNOWN, Sogreah, *Grenoble, France*

To study the possibilities of tourism in the valley of Escoumes which is now flooded by the Dam of Vinca.

SUPPORTED BY French Government

3.0021, CRIME PREVENTION

J.C. PEREZ, Guam Gov. Comm. on Ch. & Youth, *Agana, Guam*

The objective of this program is to prevent youth delinquency within the various villages. To achieve this objective an intensive recreation athletic program is to be developed, organized and carried in the heart of the various troubled villages. Local village youth leaders will be recruited, trained and assigned to their respective villages. A phase of this project is to be devoted specifically to prevent deviant behavior by young girls. Programs geared to the interest of young girls will be organized and directed by qualified staff. It is estimated that this project will reach more than 500 youths not involved in any youth program.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - S.R.S.

3.0022, REHABILIATION THROUGH RECREATION

D.L. JEWELL, Illinois Security Hospital, *Chester, Illinois* 62233

The project as originally proposed, is designed to demonstrate the value of a varied and intensive therapeutic activity therapy program, utilizing certain types of activities that will provide positive therapeutic benefits for the residents of the institution. Approximately 43% of the 284 patients are individuals who are considered incompetent to stand trial for a felonious offense and who are in need of mental treatment. The remaining patients are individuals who are considered to be severe behavioral problems and in need of maximum security treatment. The population is all male with an average age being 34 years 1 month. Illinois Security Hospital is the only maximum security facility within the State of Illinois, Dept. of Mental Health.

The program was initially established in 1966 through an HIP Grant. The primary purpose for the establishment of an activity therapy or recreation program is to change maladaptive behavior and thought disorders to more acceptable limits. The program is conducted with close cooperation with various other therapeutic modalities within the institution. Recently the program has changed from a purely centralized program structure. Centralization of program is still in existence to some degree, but with the onset of the treatment unit concept, it has been necessary for the Activity Therapy Department, as well as the other ancillary services, to decentralize their program and to incorporate themselves within each unit structure. Within the unit structure, the Activity Therapy program emphasizes activity rather than recreation, with the emphasis being in the centralized area upon the voluntary utilization of leisure time or purely recreational activity. In both programs, we attempt to meet what are considered basic needs of the patients. Such needs are recognition, acceptance, creative outlet, and a sense of accomplishment. Other professional disciplines are in agreement when crediting the activity program for playing a major role in the decrease of length of stay or the more rapid patient progression through the prescribed treatment format.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - P.H.S.

3.0023, RECREATIONAL IMPACT OF FEDERAL MULTI-PURPOSE RESERVOIRS

W.L. GRECCO, Purdue University, Joint Highway Research Project, *Lafayette - West Lafayette, Indiana* 47907

In Phase I of this study, models were developed which predict the numbers and characteristics of users of multi-purpose reservoirs, the sphere of influence of the reservoirs, the characteristics of the traffic generated, and the effects on land use and land value.

The objective of Phase II was to evaluate the stability over time of the model developed in Phase I which predicted the amount of recreational trips to new reservoirs in Indiana. In addition, a new model was developed to predict future travel to the larger Monroe Reservoir. A secondary objective of this phase was to estimate the total amount of gasoline consumed per year by motorboats in the State for which state fuel tax was paid and unrefunded.

The objectives of Phase II were accomplished.

SUPPORTED BY U.S. Dept. of Transportation - Public Rds.

3.0024, WATERFOWL POPULATIONS AND RECREATIONAL USE PATTERNS IN THE PROPOSED SAYLORVILLE RESERVOIR AREA AS RELATED TO PRE-IMPOUNDMENT CONDITIONS

A.O. HAUGEN, Iowa State University, School of Agriculture, *Ames, Iowa* 50010

This study comprises the first of what should be considered a two- phase study to determine the impact of the alteration of an environment on waterfowl occurrence and recreational use patterns at the Saylorville impoundment now under construction on the Des Moines River in Central Iowa.

Rrcreation activity on undeveloped parts of the Saylorville area was centered on the river. Problems of access influenced use of particular recreation sites, and so over all use of the area was light, particularly on week days. People stayed close to bridges and open timber areas in the bottomlands for fishing and camping activity. A small group of people familiar with the area accounted for most of the camping use. Flat-bottomed fishing boats were the most common river craft observed. Fifty per cent of all observed recreation occurred on weekends and 21% occurred on five holidays during the summers of 1968 and 1969. The people of Polk and Boone counties used the area as a day- use type area and most visits were from 3 to 6 hours long. Motorcycling, hunting, and target practice with firearms were important recreation uses in the area, but they all had potential for conflicting with other recreation uses. Motorcycle trail-riding and hillclimbing was noisy and resulted in soil erosion. Target practice with firearms was loud and dangerous for other recreationists. Hunting was dangerous, particularly for campers or nature enthusiasts and sightseers. Most waterfowl were observed on the river during spring migration and little waterfowl hunting was observed on the river in the fall.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

3.0025, SOCIOLOGICAL ASPECTS OF WATER-BASED RECREATION IN IOWA

D.R. YOESTING, Iowa State University, Graduate School, *Ames, Iowa* 50010

The major purposes of the proposed research are to determine the beliefs (knowledge) and attitudes that the public has toward water based recreation; to determine the attitudes of the public toward the existing water management programs and agencies in relation to water- based recreation; and to determine the relationships, if any, between personal and social characteristics of individuals toward water-based recreation facilities and their management.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

3.0026, TO APPLY PSYCHOL. PRINCIPLES TO PROGRAM PLANNING AND GUIDANCE & CONTROL

A. VANKREVELEN, Berea College, Undergraduate School, *Berea, Kentucky* 40403

Purpose: Guidance and control of camper behavior. To get the campers' viewpoint.

Subjects: Samples have been taken from two private camps age levels from 8 yrs through teens.

Methods: Interview, program manipulation.

Findings to date: Campers resist changes in program and traditional procedures. However do adapt and can change opinions (these findings are based on a small sample and are very tentative).

SUPPORTED BY No Formal Support Reported

3.0027, CONSUMER ANALYSIS FOR SPECIFIC FOREST-ORIENTED RECREATIONAL ACTIVITIES IN THE NORTHEAST

T.J. CORCORAN, Univ. of Maine, Agricultural Experiment Sta., *Orono, Maine* 04473 (ME00208)

OBJECTIVE: Identify and analyze those social, psychological and economic variables which motivate consumers to participate in outdoor recreational activities. Ascertain and evaluate consumer satisfaction with locational and environmental factors as they relate to consumption patterns. Identify and analyze the reactions of participants to rules and regulations, physical facilities, social activities and off-site accessory attractants. Identify and analyze the expenditures incurred by those who actively participate in outdoor recreational activities. By means of mail question survey of a random sample of hunting and fishing license holders in Maine, information on consumer characteristics, satisfaction with locational and environmental factors, reactions to regulations and facilities, and expenditures will be collected, analyzed, and interpreted.

APPROACH: A randomly selected sample of 2,2[illegible]7 sportsmen -- stratified according to type of Maine hunting or fishing license held in 1965 -- taken and analyzed by means of summary factor, and preference rating analysis as well as by various statistical methods including correlation to develop the relationships suggested in 'objectives' above.

PROGRESS: A modification of the regional computer program has been completed and is currently being utilized on an I.B.M. 360-Model 30 computer. The program will handle the fishing and hunting survey data as coded by the participating states and previously summarized at Massachusetts. Maine data has been separated into 6 categories based upon whether an individual can be considered a pure hunter, a pure fisherman, or a combination hunter or fisherman in terms of his (her) Maine sporting experience, and as to whether they are residents or non-residents of Maine. A tabulation of responses to the questionnaire have been made for the categories by the modified program. Summary and appropriate statistical analyses are now underway. Questionnaires designed specifically to provide further or update information have been planned for submission to resident and non-resident Maine sportsmen. These will be sent to the original survey sample along with copies of the 'State' publication.

SUPPORTED BY U.S. Dept. of Agriculture

3.0028, A CREEL CENSUS OF THE SHAD FISHERY BELOW HOLYOKE

P. OATIS, State Div. of Fisheries & Game, *Boston, Massachusetts* 02202

Objectives: To determine the pressure on and success of the sports fishery for shad below the Holyoke Dam.

Prodedures: During the seven-week period of the shad run at Holyoke, a creel census of shad fishermen will be carried out in the vicinity of Holyoke. Implementation of this job will require a creel census agent working a total of five eight-hour working days per week including all weekend days and three weekdays. The census agent will cover either a shift from 6:00 A.M. to 2:00 P.M. or from 2:00 P.M. to 10:00 P.M. Two angler counts will be made during each shift at the hours of 7:00 and 11:00 A.M. or 3:00 and 7:00 P.M. recording number of boats, boat anglers, and shore anglers. Shore fisherman interviews will be made at angler concentration points including but not limited to the pool one-half mile below the Holyoke Dam and the Willimansett Bridge. Boat anglers will be interviewed at the public launching ramp on the east bank near the Massachusetts Turnpike Bridge and on the west bank at Ezold's Marina.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0029, HUNTER OBSERVATIONS AND BAG CHECK DATA

W.W. BLANDIN, State Div. of Fisheries & Game, *Westboro, Massachusetts*

Objectives: To provide data that will allow a check to be made on the accuracy of hunter responses to the mail questionnaire survey with respect to the special black duck season.

Procedures: Hunter observations will be made by state biologists and data recorded on standard hunter performance cards. The observations will be distributed evenly throughout the experimental season. not at the expense of hunter observations. Standard bag check data cards will be used.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0030, HUNTER ATTITUDE SURVEYS

L.A. RYEL, State Res. & Dev. Division, *Lansing, Michigan* 48926

Objectives: To conduct mail and/or interview surveys to determine hunters' attitudes concerning various aspects of hunting.

Procedure: Obtain a statistically adequate sample of licensees from files of license carbon copies and obtain at least a 90 percent response rate by mail questionnaire or personal interview.

Relatively simple questions will probably be handled by mail questionnaires while more complex situations can best be evaluated through personal interviews.

Activity on this job will depend on current need for such surveys, particularly in connection with any-deer seasons. It is expected that a mail survey of about 1,200 deer hunters concerning opinions on the necessity of hunting antlerless deer, and what factors contribute to deer numbers, will be conducted. Additional deer hunter surveys may be needed depending on current deer hunting regulations. Samples of small game hunters may be interviewed to determine their preference for various types of seasons or regulations and their behavior in certain hunting situations.

This project is conducted annually to keep abreast of hunter attitudes about special or controversial hunting regulations.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0031, REHABILITATION THERAPY PROGRAM

C.G. BAKER, Newberry State Hospital, *Newberry, Michigan* 49868

Future plans include the continued rehabilitation of patients in socialization, personal hygiene, working ability, recreation, and utilization of basic community services. To accomplish this, hospital recreational activities will be regularly scheduled in addition to off grounds activities including a 14-day camping trip in which all patients will participate. The ward living quarters will also be provided with items which allow individual or group diversional activities. Male patients will receive work assignments which foster good working habits and rehabilitation in basic skills. Female patients will be scheduled domestic activities such as cooking, clothes washing and ward cleaning. All patients meeting required criteria will be enrolled in the hospital's Vocational Training Program.

All patients, in need, will be supervised and taught appropriate grooming, dining and personal hygiene habits. Supervision and instruction will also be provided for community shopping, dining, church attendance, telephoning, etc. Additional activities planned include the establishment of a ward store, an arts and crafts work shop, and a well structured reinforcement therapy program.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - P.H.S.

3.0032, PROJECTIONS OF THE NUMBER OF SKIERS IN THE GREAT LAKES STATES

W.A. LEUSCHNER, U.S. Dept. of Agriculture, North Cen. Forest Expt. Sta., *Saint Paul, Minnesota* 55101

Number of skiers will be projected by age group. The ratio of skiers to total population will be calculated by age group and applied by a computerized demographic model to exogenously determined age group population projections. Skier participation rates in the form of days skied per season will be calculated and applied to the above results to estimate total attendance.

SUPPORTED BY U.S. Dept. of Agriculture

3.0033, A PILOT SURVEY FOR A STUDY TO DETERMINE USER ATTITUDES AND PERCEPTIONS OF CROWDING IN THE BOUNDARY WATERS CANOE AREA

D.W. LIME, U.S. Dept. of Agriculture, North Cen. Forest Expt. Sta., *Saint Paul, Minnesota* 55101

From several methods, determine which one or combination best identifies visitor satisfaction in terms of their sensitivity to crowding, methods of back-country travel (canoe, motor canoe and motor boat), littering, campsite wear and tear, natural ecosystem values, and others for various locations in the Boundary Waters Canoe Area and different seasons of the year. These methods include: (1) trip diary, (2) back-country lake personal interview, (3) back-country lake use registration station, and (4) mail questionnaire.

SUPPORTED BY U.S. Dept. of Agriculture

3.0034, THE CAMPERS AND OUTFITTERS OF THE BOUNDARY WATERS CANOE AREA - THEIR ATTITUDES AND INTERACTIONS

S.F. MCCOOL, Univ. of Minnesota, School of Forestry, *Saint Paul, Minnesota* 55455

To describe the social psychology of the outfitting process. To determine the role of the outfitter in the wilderness experience. To determine user and outfitter attitudes toward the management of the Boundary Waters Canoe Area. To determine communication patterns between the Forest Service and the outfitters.

SUPPORTED BY U.S. Dept. of Agriculture

3.0035, THE ROLE OF OUTDOOR RECREATION IN THE MANAGEMENT OF THE MEMORIAL HARDWOOD FOREST OF MINNESOTA

L.C. MERRIAM, Univ. of Minnesota, Agricultural Experiment Sta., *Saint Paul, Minnesota* 55101 (MIN-19-040)

OBJECTIVE: Study the recreation use patterns of the Memorial Hardwood Forest to determine types of uses, users and the attractive features of the Forest as a recreation destination. Study land, forest and general environmental capability in relation to recreation user desires and Forest potentials for recreation in multi-resource use framework. Special emphasis to be placed on the Whitewater drainage with comparison as applicable to the other major drainages. Develop recreation policy guidelines possibly helpful to managers of the Memorial Hardwood Forest.

APPROACH: Work will include field study of forest in relation to potential and proposed recreation use.

PROGRESS: Within Winona County a comparison interview study was made of the outdoor recreation pursuits of rural and urban (Winona) residents. This was the second phase of the Hardwood Forest Study, and was carried out during the summer of 1968. Respondents were adult males selected at random from the current county atlas and city directory. The interview measured elements in the leisure environment and those sought therein as related to the Memorial Hardwood Forest. Interesting insights were obtained into recreation perception differences.

SUPPORTED BY U.S. Dept. of Agriculture

3.0036, RELATIONSHIPS BETWEEN RECREATION LAND MANAGEMENT AND USER SATISFACTION

L.C. MERRIAM, Univ. of Minnesota, Agricultural Experiment Sta., *Saint Paul, Minnesota* 55101 (MIN-19-043)

OBJECTIVE: Study and analyze the recreational use, development, and management objectives of several Minnesota state forests and state parks. Study recreation area visitors to determine the imagery they have of nature, the forest, wildland (wilderness), and outdoor recreation, and find whether city people transpose urban recreation habits to forest environments. Determine how user satisfaction is influenced by management. Determine how these management user interactions influence area and regional recreation planning and programs.

APPROACH: St. Croix and Scenic State Parks, Como Park and Fort Snelling (St. Paul), St. Croix and George Washington State Forests, and the Superior National Forest in Minnesota. Field work will start at St. Croix State Park. The study hypothesis is that urban recreationist transpose their imagery and recreation habits to rural forest and park areas as evidenced by choice of activity and development preferences. Study to continue for five years with re-evaluation for further study.

PROGRESS: The St. Croix State Park Camping and Family Cohesiveness Study was completed this summer. Also during 1968 the second phase of the study was started. From June 15 through September 1, 1968 Twin City users of city and state parks were interviewed to determine recreational behavior, to gauge naturalistic perception and to relate these factors to recreation management. Parks studied were: Minnehaha, Minneapolis; Phelan, St. Paul; Scenic, St. Croix and Whitewater State Parks. Data is now being analyzed.

SUPPORTED BY U.S. Dept. of Agriculture

3.0037, IMPACT OF WATER QUALITY AND QUANTITY ON FOREST RECREATION IN THE NORTH CENTRAL REGION

J.A. NICOLSON, Univ. of Minnesota, Graduate School, *Saint Paul, Minnesota* 55101

Study Objectives: To assess possible recreational trends which would be related to water quality and/or quantity changes in the past and to establish some measure of preference and tolerance of the recreationist for water quality and quantity in the recreational experience.

Justification: This broad regional project is designed for forecasting future supply of and demand for recreation in the North Central Region. Specific contributions of water quality and quantity to the amenity package of the recreational experience have not been defined which is a prerequisite for proper consideration when making predictions of future supply and demand for forest oriented recreation.

Methodology: Past trends in recreational use will be secured for public forest lands and related to records of water quality and quantity. Measures of preference and tolerance by the recreationist for certain levels of water quality and quantity will be estimated from interviews. Attempts to define cutoff points of water quality, tolerance and water quantity preference will be made. Both surface and groundwater aspects of water quality and quantity will be considered.

Time, Cost, Manpower: This proposed three year study will be initiated in July, 1969. It will be conducted as a 3 phase study. Phase one will yield estimates of recreational use on public forested lands. Phase two will determine water quality and quantity data to correlate with use patterns. Phase three will yield information pertaining to public preference and tolerance levels related to water quality and quantity.

A minimum of $5,000 per year will be required, including support funds for a one-half time graduate research assistant.

SUPPORTED BY No Formal Support Reported

3.0038, LOCAL GOVERNMENT AND POLICY IMPLICATIONS OF SEASONAL HOME OWNERSHIP IN RURAL AREAS

R.W. SNYDER, Univ. of Minnesota, Agricultural Experiment Sta., *Saint Paul, Minnesota* 55101 (MIN-14-090)

OBJECTIVE: This study represents an effort to obtain accurate detailed information on the following subjects by interviewing a random sample of seasonal recreation property owners; physical characteristics of seasonably used property; expenditures by property owners in the seasonal home community; extent and nature of use of seasonal home; attitudes toward public services, facilities and policies; related information. Survey results will be supplemented with data from sources within the county selected for study and from published reports. Descriptive and analytical procedure will demonstrate the motives for seasonal home ownership, the impact of seasonal home use on the rural community, the adequacy of public policies and services, and other factors that are related to the future development of this segment of the rural economy.

PROGRESS: Mistakes in data collection were rectified. Data analysis of the factors affecting seasonal homes development and economic impact was continued. Dissatisfaction of cabin owners is due in part to the reluctance of local units to provide public goods and services. But the ability to provide them is present. A tax base analysis comparing a group of counties with second homes with another group lacking them shows that local government units in the first group (with seasonal homes) have a greater capacity to provide goods and services than those in the second group. The analysis also showed that real property and business property make up a larger proportion of the property tax base for the first group. County road expenditures are higher for counties with second homes, but not as high as their fiscal capability would suggest. Highway 'construction needs' as determined by the state are higher for counties with cabins. Townships expenditures for roads in the two groups of counties spent at levels roughly commensurate with their comparative fiscal capacities. Since poor roads, often township roads, were a complaint of seasonal homeowners, a program to provide financial aid to townships may be in order; results were inconclusive, however, and the effects of 1967 tax legislation were not considered. School districts with second homes do not spend more per pupil than those without, despite greater fiscal ability.

SUPPORTED BY Minnesota State Government

3.0039, HARVEST OF FISH - HUZZAH AND COURTOIS CREEKS

G.G. FLEENER, State Dept. of Conserv., *Jefferson City, Missouri* 65102

Objectives: To estimate the annual fishing pressure and yield of fish to anglers from two smallmouth bass streams and to evaluate the effect of a 'fishing for fun only' regulation.

Procedures: This creel census covers 5.37 miles of Huzzah Creek and 6.25 miles of Courtois Creek.

One creel census clerk, working under the direction of the project leader, conducts the creel census on both streams during each work day, according to a random schedule. Both stream sections are sampled on all weekend days and holidays and on two weekdays each week between March 15 and December 1. By employing a postal card form which the clerk hands to anglers who have not completed their fishing trips, census information is obtained from the greatest number of trips possible. Estimates of fishing pressure and yield of fish are made for monthly periods. The residence of anglers is determined.

A 'fishing for sport only' regulation on smallmouth bass in Courtois Creek became effective in 1969. This is aimed at maintaining a greater number of large smallmouth bass in the population. Effects on the population structures and standing crops of the various species present will be closely followed and evaluated.

Beginning also at the start of the smallmouth bass season, May 30, 1969, a minimum length limit of 12 inches will be placed on smallmouth bass in Huzzah Creek. The length composition of this species in the catch has been determined from past years of study. The clerk will obtain numbers and lengths of smallmouth bass that are caught and returned to Huzzah Creek in compliance with the minimum length regulation, and the lengths of those returned to Courtois Creek in compliance with the 'fishing for fun only' regulation.

The creel census started on March 16, 1969, and will continue until work on the other jobs under this work plan are terminated.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0040, HARVEST OF FISH FROM THE BIG PINEY RIVER

G.G. FLEENER, State Dept. of Conserv., *Jefferson City, Missouri* 65102

Objectives: To estimate the annual fishing pressure and yield of fish from designated sections of the Big Piney River, to evaluate the effect of a length limit on the fishery for smallmouth bass, and to measure the gigging pressure and harvest during the legal gigging season.

Procedures: This creel census will cover 44 miles of Big Piney River: (1) Dogs Bluff to Boiling Spring, 16 miles: (2) Boiling Spring to Slabtown, 14 miles; and (3) Slabtown to Ross Bridge, 14 miles.

Two census clerks will conduct the census, according to a random schedule, using a canoe powered by a motor. The census will be conducted on all weekend days and holidays and on week days for a total of 24 days per month between March 15 and September 30, and 12 days per month in October and November. Since hook-and-line fishing is light after October 1, the angling census is reduced. A postal card will be given to fishermen who have not completed their fishing trips to obtain census information from as many completed trips as possible.

Estimates of fishing pressure, yields, and catch-rates will be made for monthly periods. The residence of anglers will be determined.

Beginning at the start of the smallmouth bass season, May 30, 1967, a minimum length limit was placed on smallmouth bass. The length composition of this species in the catch has been determined for past years of study. The census clerks will obtain numbers and lengths of smallmouth bass that are caught and returned to the stream in compliance with the minimum length regulation. Emphasis will be placed upon scale samples from smallmouth bass. Changes in age composition of the catch, upon over-all growth rate, and upon catch-rates will be measured to evaluate the effect of the minimum length limit.

During the legal gigging season (October 1 through December 31), two census clerks will conduct a gigging census for 12 days each month. The census days will be selected during dark-of-the-moon periods when conditions are usually more favorable for gigging. The clerks will work from 4:00 p.m. until 12:00 midnight each day. Giggers will be contacted at all access points within the present census area according to a schedule. An estimate of gigging pressure and harvest will be determined.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0041, HARVEST OF FISH FROM THE CURRENT RIVER

G.G. FLEENER, State Dept. of Conserv., *Jefferson City, Missouri* 65102

Objectives: To estimate the annual fishing pressure and yield of fish to anglers from Current River, and to evaluate the effect of stocking walleye fry and fingerlings.

Procedures: Two census clerks will conduct the census on sample sections of the stream according to a random schedule and using canoes powered by motor. A total of 64 miles of Current River are sampled on all weekend days and holidays and on weekdays for a total of 24 days per month between March 15 and December 1. A postal card form is used to obtain information from fishermen who have not completed their fishing trips.

Estimates of fishing pressure, yields and catch-rates are made for monthly periods. The residence of anglers is determined. Special emphasis is placed on obtaining an estimate of float-fishing pressure.

Massive stockings of walleye fry were made in 1967 and 1968, but not in 1969. These stockings were made at numerous sites within the area. Stockings of walleye fingerlings will be made in alternate years, beginning in 1970 and extending through 1972. The contribution of stockings to the creel will be measured primarily by the quantitative creel census.

A voluntary creel census by a few walleye anglers will be conducted through December and continued through March 14 in order to measure the winter fishery for walleyes.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0042, HARVEST OF FISH IN SELECTED AREAS OF TABLE ROCK RESERVOIR

W.D. HANSON, State Dept. of Conserv., *Jefferson City, Missouri* 65102

Objectives: To determine the fishing pressure, rate of fishing success, hook-and-line yield by season, and to complement white and black crappie life history studies taking place in these areas.

Procedures: Two job-trained creel census clerks will conduct the census in four designated areas. They will count boat and shore fishermen twice daily, according to a prearranged schedule, with the two counts being started at opposite ends of the census area. During the remainder of the working day, they will contact fishermen both on shore and in boats. Only those creels inspected by the clerks will be reported. When practicable, the clerks will obtain lengths, weights, and scale samples, particularly for species which are difficult to net. A record of air and water temperatures, lake conditions, and pertinent observations of fish activity will be kept daily. When tagging operations are conducted on the lake, the clerks will solicit the cooperation of boat dock owners and anglers to recover as many tags as possible. They will also collect crappie scales, gonads, stomachs and length distribution information as required.

Calculations of species composition of the catch, fish per hour, average length of fishing trips, percentage of successful anglers, and average size of each species taken will be made directly from the census records. For composition of yield, the data will be divided into seasonal periods. For each period, the estimated total catch will be equal to the product of: mean of daily count averages, length of census day, number of days in period, and rate of catch in fish per hour. Data from weekends and weekdays will be treated separately. Data will be compiled and summarized each quarter by data processing.

Justification: The creel census will be used to complement the life history work (WP3I, Job 1) being done on white and black crappie in Table Rock Reservoir. Crappie have been found to be cyclic, with highs and lows occurring in the creel without regard to present knowledge. Year-classes will be ascertained by intensive life history work corroborated by creel census as the various year-classes enter the catch. The crappie is usually the number one species sought after by Missouri anglers who fish reservoirs.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0043, HARVEST OF FISH IN LAKE OF THE OZARKS

W.D. HANSON, State Dept. of Conserv., *Jefferson City, Missouri* 65102

Objectives: To determine the fishing pressure, rate of fishing success and the hook-and-line yield by season, and to evaluate the introduction of striped bass.

Procedures: A job-trained creel census clerk will conduct the census over two appropriately sized areas on the reservoir on randomly assigned working days. Each area will be treated as a separate unit. He will count boat and shore fishermen twice daily according to a prearranged schedule, with the two counts being started at opposite ends of the census area. During the remainder of the working day he will contact fishermen on shore, in boats and at various launching and docking facilities. Only those creel inspected by the clerk will be reported. When necessary, the clerks will obtain lengths, weights, and scale samples of selected fish species. A record of air and water temperatures, lake conditions and pertinent observations of fish activity will be kept daily.

Calculations of species composition of the catch, fish per hour, average length of fishing trips, per cent of successful anglers, and average size of each species taken will be made directly from the census record. For composition of yield, the data will be divided into monthly and seasonal periods. For each period, the estimated total catch will be equal to the product of: mean daily count averages, length of census day, number of days in period and the rate of catch in fish per hour. Data from weekends and weekdays will be treated separately. Data will be compiled and summarized each quarter by data processing.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0044, HARVEST OF FISH IN POMME DE TERRE RESERVOIR

W.D. HANSON, State Dept. of Conserv., *Jefferson City, Missouri* 65102

Objectives: To determine the fishing pressure, rate of fishing success, and the hook-and-line yield by season, and to evaluate the effect of introduced muskellunge.

Procedures: A job-trained creel census clerk will conduct the census over two designated sample areas of the reservoir, giving equal days' effort to each area. He will count boat and shore fishermen twice daily, according to a prearranged schedule, with the two counts starting at opposite ends of the areas. During the remainder of the working day, he will contact fishermen who have fished or are fishing, on shore and by boat. Only the creels actually checked by the clerk will be reported. When practical, the clerk will obtain other information as it is needed, such as lengths, weights, scale samples, and stomach samples. A record of air and water temperatures, lake conditions, turbidity, and pertinent observations on fish activity will be kept daily. An attempt will be made to obtain catch and release data on sublegal muskellunge.

Calculations of species composition of the catch, fish per hour, average length of fishing trips, per cent successful anglers, and average size of each species taken will be made directly from the census records. For composition of yield, the data will be divided into monthly and seasonal periods. For each period, the estimated total catch will be equal to the product of: mean of daily count averages, length of census day, number of days in period, and rate of catch in fish per hour. Data from weekends and week-days will be treated separately. Data will be compiled and summarized each quarter by data processing.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0045, HARVEST OF FISH IN THOMAS HILL RESERVOIR

W.D. HANSON, State Dept. of Conserv., *Jefferson City, Missouri* 65102

Objectives: To determine the fishing pressure, rate of success, and the hook-and-line yield by season. To determine what influences a warmwater discharge from a power plant has upon angling success and seasonal angler-use patterns.

Procedures: One job-trained creel census clerk will conduct a census on the entire reservoir on a one-half time basis. He will count boat and shore fishermen twice daily, according to a prearranged schedule, with the counts being started at opposite ends of the census area alternately. The lake will be divided into five areas, each area being treated as a separate unit for later comparative purposes. During the remainder of the working day, the clerk will contact fishermen both on shore and in boats in each of the five areas. Only those creels inspected by the clerk will be reported. In addition, the clerk will obtain lengths, scales and stomachs for designated species as the need arises. A record of air and water temperature, Secchi readings, and lake levels will be kept daily for each area. When tagging operations are conducted on the lake, the clerk will solicit the cooperation of anglers, Conservation Agents and local people for tag return information.

Calculations of species composition of the catch, fish per hour, average length of fishing trips, total trips, per cent successful anglers, and the average size of each species taken will be made directly from the creel census records. For composition of yield, the data will be divided into seasonal periods. For each period, the estimated total catch will be equal to the product of mean daily count averages, length of census day, number of days in the period, and rate of catch in fish per hour. Data from weekdays and weekend days will be treated separately. Information will be compiled and summarized each quarter by data processing.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0046, OUTDOOR RECREATION FOR THE HANDICAPPED (TECHNICAL APPENDIX TO THE ARKANSAS SCORP--1969)

G.E. OKEEFE, Midwest Research Institute, *Kansas City, Missouri* 64110

This Technical Appendix, supplementing the Arkansas Statewide Comprehensive Outdoor Recreation Plan of 1969, was designed to (1) determine the demand for outdoor recreation for each of the three major handicapped groups; (2) identify the supply of outdoor recreation facilities and programs available for the handicapped; (3) identify problem areas; (4) project the needs for outdoor recreation facilities and programs for the handicapped; and (5) develop an action program that will provide necessary opportunities for the handicapped.

The study considered the mentally retarded, the physically handicapped, and the culturally deprived youth living in urban areas.

SUPPORTED BY Arkansas State Government

3.0047, STATEWIDE CREEL CENSUS

G.D. HOLTON, State Fish & Game Department, *Helena, Montana* 59601

The main purpose of this project is to determine the number of fishermen days spent in Montana annually and how they are distributed over the waters of the state. Information will be collected on as many lakes and streams as possible.

The sampling plan has been developed with the assistance of a statistician.

Questionnaires will be mailed to samples of resident fishermen twice a month during the main fishing season and once a month during the remainder of the year. Holders of nonresident one-day, six-day, and seasonal licenses will also be sent questionnaires throughout the year on schedule adapted to the type of license and the season. Nonrespondents will be sent one follow-up questionnaire.

Unlicensed fishermen (i.e., fishermen under 15 years and residents of certain state institutions) will not be censused.

Data from these surveys will be combined in a program to be written for the IBM 360 computer which will permit storage of these data on magnetic tapes. The data can be added to previously collected data over a period of several years until the sample size is adequate on the smaller bodies of water to estimate pressure.

Also, the fisherman log program will be continued. Cooperating fishermen maintain logs of their fishing in booklets furnished by the Fish and Game Department. In December the booklets are recalled, the data are punched onto IBM cards, and the booklets returned to the individual anglers. The information on fishing effort and success is compiled by individual water and filed in District Headquarters and in the Helena Fisheries Office.

Maintenance of the master lake and stream list and file will be part of this job.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0048, WESTERN WILDERNESS RECREATION USE AND MANAGEMENT

R.C. LUCAS, U.S. Dept. of Agriculture, Intermtn. For. & Rg. Exp. Sta., *Missoula, Montana* 59801 (FS-INT-1903)

OBJECTIVE: Determine ways for providing wilderness use and maintaining wilderness settings.

APPROACH: Studies will deal with (a) wilderness visitors, to meet their needs, enhance their enjoyment, and accommodate increasing numbers, (b) wilderness plant and animal ecology, (c) wilderness protection from destructive insects, disease, and fire.

PROGRESS: The past year was the first full year for the wilderness management research work unit. During the year staffing was completed and visits were made and problems discussed with wilderness managers in ten areas in the northern Rockies. A study of wilderness recreational use and methods of measuring it is underway, using the Mission Mountains Primitive Area as a test area. Registration rates were satisfactorily high in the summer (71 percent), but lower (50 percent) in the fall. Using an unmanned registration system as a base for calculating wilderness use looks feasible. The Missions have somewhat more visitors than previously estimated, but stays are shorter--it is predominantly a day-use area. Distribution of use is extremely uneven geographically. A major study dealing with wilderness carrying capacity from the point of view of visitors' objectives, knowledge, and attitudes has been planned. A comprehansive survey to characterize wilderness use and users in the northern Rockies is being planned. Contacts with other interested scientists led to three studies. The University of Montana's School of Forestry is studying the historical ecology of a portion of the Bob Marshall Wilderness. The Intermountain Station's northern Rocky Mountain wildlife habitat research work unit is investigating broad- scale variation in wilderness vegetation. The City University of New York, through its Environmental Psychology Program, is reviewing the applicability of psychological research methods to relating wilderness environmental conditions to visitor benefits.

SUPPORTED BY U.S. Dept. of Agriculture

3.0049, PILOT STUDY FOR A BASIC WILDERNESS USE SURVEY

R.C. LUCAS, U.S. Dept. of Agriculture, Forestry Sciences Laboratory, *Missoula, Montana* 59801

The methods used in the past to sample wilderness visitors have serious weaknesses--small samples, high costs, and several sources of serious bias. A test of several new methods for obtaining sample lists of wilderness visitors was carried out during the 1969 season. One method, using a sign that informed visitors that research was in progress and that explained why names and addresses were needed, produced high registration rates, especially for hikers (over 90 percent compliance). Nonregistrants were also sampled, through personal contact. Over 90 percent of both registrants and nonregistrants completed questiomnaires and mailed them back. The two groups differed significantly. Party leader responses also differed from the answers of other party members, demonstrating the flaw in sampling from the conventional trail register on which the leader registers for the group.

SUPPORTED BY U.S. Dept. of Agriculture

3.0050, THE RECREATIONAL CARRYING CAPACITY OF WILDERNESS

G.H. STANKEY, U.S. Dept. of Agriculture, Forestry Sciences Laboratory, *Missoula, Montana* 59801

To determine the effects of the various characteristics of recreational use on the quality of the wilderness recreation experience. The study defines the manner in which users perceive capacity, what factors influence this perception, what effects perceived excesses in capacity have on visitor attitudes and spatial behavior, and visitor attitudes toward the various management alternatives available to increase capacity and/or to limit use.

A three part questionnaire was administered to visitors to the Bob Marshall, Bridger, and High Uintas Wildernesses and the Boundary Waters Canoe Area during the summer of 1969.

SUPPORTED BY U.S. Dept. of Agriculture

3.0051, ENVIRONMENTAL PLANNING ALONG MONTANA'S 'BLUE-RIBBON' TROUT STREAMS

S.S. FRISSELL, Univ. of Montana, School of Forestry, *Missoula, Montana* 59801

Although Montana's streams have been classified and mapped and certain portions identified as being of national significance, little progress has been made toward the development of programs which would insure the protection of stream-side aesthetic environment. This study will investigate the so-called 'blue-ribbon' trout streams (of national significance) with the following objectives: 1) To prepare an inventory of ownership patterns and land-use practices on lands adjacent to the streams, 2) To assess the impact of existing and proposed land use on the streamside environment and on fishing quality, 3) To evaluate land management programs, policies and legislation in Montana and other states to determine their effectiveness in stream protection, and 4) To prepare guidelines and suggested management alternatives for the protection of stream-side environments in Montana.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

3.0052, EVALUATION OF THE LAKE MEAD SPORT FISHERY

D. LOCKARD, State Dept. of Fish & Game, *Las Vegas, Nevada*

Objectives: To determine the contribution of various stocked and naturally produced game fishes to the sport fishery.

Procedures: A statistically valid creel census will be conducted at boat landings about the lake to provide the basis for determination of harvest of game fishes. Data of catch per hour, species and size of fish caught and related information will be accumulated. Checks will be conducted in a manner to allow contact of a maximum number of anglers and their catch. Angler use and catch data will be used in conjunction with traffic counters and angler questionnaires to arrive at total use and harvest figures.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0053, INDEPENDENT HOUSING FOR THE ELDERLY

M.J. MEEUWIG, Univ. of Nevada, Agricultural Experiment Sta., *Reno, Nevada* 89507 (NEV00905)

OBJECTIVE: Determine experimentally those housing requirements of the elderly which are necessary for independent living.

APPROACH: One and two person households are becoming more prevalent and the mobile home has become widely accepted in the Las Vegas and Reno areas with many elderly choosing this type of housing. Housing problems of the elderly are critical because of limitations on income, energy, availability of financing and their social disorientation. A lack of information exists as to needs of the elderly related to mobile home park and community facilities. It is assumed that satisfaction with this type of living will depend largely on facilities provided in the mobile home park and adjacent area. There is a need to determine desired facilities, the actual use of various facilities and the satisfactions resulting from different types of facilities. This information would contribute to future planning recommendations.

PROGRESS: To attain the goal of helping develop standards in housing design for senior citizens, the focus has expanded. Previous work concerned only mobile homes. Current work includes samples drawn from all types of dwelling units and will establish the degree of social orientation or disorientation of occupants. Using previously established characteristics of housing for the elderly, an instrument was developed to determine if housing meets needs. Extra essential activities within or without the home are also being surveyed. Researchers are presently compiling interviews with a sample of elderly people drawn from single family homes, multiple and limited-multiple dwellings, public low-cost housing units, hotel and motel accomodations and mobile homes. 198 interviews have been completed. 52 remain to be done before data analysis begins.

SUPPORTED BY U.S. Dept. of Agriculture

3.0054, CONSUMER ANALYSIS FOR SPECIFIC FOREST-ORIENTED RECREATIONAL ACTIVITIES IN THE NORTHEAST

R.H. FORSTE, Univ. of New Hampshire, Agricultural Experiment Sta., *Durham, New Hampshire* 03824 (NH00175)

OBJECTIVE: Identify and analyze those social, psychological and economic variables which motivate consumers to participate in outdoor recreational activities. Ascertain and evaluate consumer satisfaction with locational and environmental factors as they relate to consumption patterns. Identify and analyze the reactions of participants to rules and regulations, physical facilities, social activities and off-site accessory attractants. Identify and analyze the expenditures incurred by those who actively participate in outdoor recreational activities.

APPROACH: Participants in camping will be surveyed, by mail questionnaire and personal interview, isolating those consumer attributes related to participation in camping. Samples of participants will be drawn and questionnaires structured so that relevant ecological units may be analyzed. Analysis of the generated data will obtain numerical magnitudes of the influence which the variables have on participation rates, consumption patterns, reactions, and expenditures.

PROGRESS: In accordance with the change of direction indicated in last year's report, a questionnaire was developed to study the economic aspects of ice fishing on Sunapee and Newfound lakes in New Hampshire. About 95 percent of the fishermen interviewed were males; formal education of fishermen was about 11 years. The average age of ice fishermen was about 37 years on Newfound Lake; 42 years on Sunapee Lake; and 48 years on Lake Winnipesaukee. Most had been ice fishing for about 20 years; about 40 percent of the fishermen had been introduced to the sport by their parent(s). The estimated average annual wage level of fishermen was about $5,500. Fishing activity was greatest on weekends, and the species most avidly pursued was the lake trout (Cristivomer namaycush namaycush). Analysis of these data is currently underway, and these results are to be considered only tentative.

SUPPORTED BY U.S. Dept. of Agriculture

3.0055, USE OF ESTUARINE AREAS

L.G. MACNAMARA, State Div. of Fish & Game, *Trenton, New Jersey* 08625

Objective: To determine the ways in which an estuarine system is used by man, the relative importance of the many uses, the man-hours of recreation and the harvest of resources it produces.

Procedure: Ground and aerial surveys, as well as creel and bag check will be made on a randomized schedule, stratified to allow for differences in activity on week days, and holiday or week end days. Bathers, boaters, water skiers, sport and commercial fishermen and shellfishermen, hunters and others using the estuary in any way will be enumerated.

It is anticipated that during the first year considerable effort will be directed toward designing the procedure to be used in collecting the data and analyzing it. Funds to retain consultants are included in this project segment.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0056, EVALUATION OF HUNTING STATISTICS

S.D. [illegible], State Div. of Fish & Wildlife, *Albany, New York* 12226

Objective: To obtain a representative sample of the New York [illegible] kill data, which will give comparable total kill data [illegible] species and regions, by habitat and hunter-type as well as [illegible] in terms of hunters per duck taken or in terms of time spent. Also, via bag checks and other questionnaires, to get this information for certain selected locations, such as on some game management areas.

Procedure: Bag checks will be made at controlled hunting grounds by management personnel; and on some open lands by project personnel. Both the F & W S Mail and Wing Surveys and the N.Y. Game Take Survey records will be used to evaluate the success and effects of the hunting seasons. Evaluation of band recoveries in terms of harvest rates will be used in an appraisal of season's effects on harvest, particularly within New York.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0057, CHARACTERISTICS OF TURKEY HUNTER POPULATIONS AND THEIR EFFECT ON TURKEYS

J. DELL, State Div. of Fish & Wildlife, *Albany, New York* 12226

Objectives: To determine turkey hunter distribution, pressure, total kill, and their relationships to one another.

Procedure: Turkey hunter distribution and success information will be collected via a turkey hunter permit and reporting system, the basic format for which is described in Job I-E, 1968-69. Briefly, the permit was designed to provide a means for the hunter to report his actual days hunted by town of hunt, kill information and to enclose a turkey leg from which age and sex determination can be made. These data will be transferred to IBM cards and tabulated by computer. Basic tabulations will include man-days of hunting pressure by date and by town, for both successful and unsuccessful hunters, hunter mobility tables showing area of residence and area of hunt and number of individuals hunting per day. Age and sex of turkeys taken will be tabulated and kill distribution plotted. The relationship between hunting pressure and turkey take in various units of the range will be explored. Attempts will be made to determine if any age ratio differences exist in various sections of the hunting area, as a possible indicator of productive variation or if these differences relate to hunting pressure.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0058, ALLOCATION OF NATURAL RESOURCES TO OUTDOOR RECREATION: FISHING

B.T. WILKINS, State University of New York, Agricultural Experiment Sta., *Ithaca, New York* 14850 (NYC00321)

OBJECTIVE: Determine participation, characteristics of participants, and predictability of participation of the populace in specified forms of hunting and fishing, including saltwater fishing.

APPROACH: Questionnaires and personal interviews will be used to develop data on saltwater fishing. Participant characteristics in other forms of fishing, and hunting, will be collected from existing sources of information. Studies will be instituted on common or related variables for predicting participation in specified forms of hunting and fishing. Satisfaction with fee fishing areas and shooting preserves will be studied among owners and users. A segment of this project will study snowmobiling

SUPPORTED BY U.S. Dept. of Agriculture

3.0059, ENVIRONMENTAL PERCEPTION - AN ANNOTATED BIBLIOGRAPHY

D. LOWENTHAL, Amer. Geographical Society, *New York, New York* 10032

This project is a companion to the proposal in the previous agenda item. Numerous publications related to the environment exist in diverse places . The disciplines involved range from architecture to ecology and engineering. The present proposal is to compile an annotated bibliography of books, reports and articles on environmental perception and behavior. This would bring together in one place references now widely scattered in periodicals and books of a dozen separate disciplines. The production of such a bibliography would contribute to a much needed convergence and synthesis of ad hoc and often sporadic efforts now carried on by individual scholars and planners working in relative isolation. As things stand today, most persons involved in research on environmental perception are either little aware of each other's work or expend considerable time, energy, and resources in efforts of search for sources. A general annotated bibliography would be a valuable aid for all research in the field and would facilitate collaboration among individuals, disciplines, and institutions working along comparable but hitherto unlinked lines.

Results: All relevant publications in geography, history, economics, sociology, architecture, town planning, and other fields over the past 15 to 25 years will be abstracted, coded on cards, and selected for annotation. An appropriate scheme of classification will be worked out, annotations prepared, and cross references provided in an index. Results will be published in a suitable form. The detail bibliographical and annotation work would be done by staff at the American Geographical Society with Mr. Lowenthal as supervisor.

SUPPORTED BY Resources For The Future Inc. -
Washington

3.0060, AN ANALYSIS OF ENVIRONMENTAL PERCEPTION AND ATTITUDES

D. LOWENTHAL, Amer. Geographical Society, *New York, New York* 10032

Specific Aims and Expected Results: The proposed research would extend Lowenthal's reconnaissance study of environmental perception which was supported by a prior RFF grant. Observer perception and associated attitudes will be surveyed for (a) subjects of similar background and education observing basically different visual environments, e.g., rural as opposed to urban and regionally differentiated landscapes (New England and Midwestern), and (b) subjects who are significantly different in terms of their social, cultural, and economic characteristics but who are observing identical landscape forms. With appropriate statistical analysis, the survey results would test whether there are certain attributes of the environment which are perceived in the same way by all individuals, and other attributes which are perceived variously by observers with different social, cultural, and economic characteristics. These results and their implication for environmental design will be published in an appropriate form.

SUPPORTED BY Resources For The Future Inc. - Washington

3.0061, DEVELOPMENT OF EDUCATIONAL PROGRAMS FOR NEW CAREERS IN RECREATION SERVICES FOR THE DISABLED

D.L. BERRYMAN, New York University, School of Education, *New York, New York* 10003

Purpose - To define the roles and functions of subprofessional recreation personnel in hospitals, extended medical care facilities, and municipal recreation departments; to develop educational programs to prepare individuals for work at the various levels identified; and to demonstrate and evaluate at least one of the educational programs developed.

Expected contribution to education - Specific recommendations for further development of curricula in community college and vocational training programs to prepare subprofessional recreation personnel for service in a variety of settings providing recreation services to ill, disabled and aged persons.

Procedures - The roles and functions of subprofessional recreation personnel in recreational activity programs in hospitals, extended medical care facilities, and muncipal recreation programs will be analyzed. Educational curricula and training programs will be developed consistent with the specific job requirements delineated by the job analysis and in accord with good vocational education practice. One training curriculum, utilizing a field unit teaching technique, will be applied with unemployed or underemployed young adults, homemakers, and a few selected older persons. Evaluation of the effectiveness of the curriculum will include: a) distribution of questionnaires to trainees, supervisors, agency administrators and clients served by the trainees to obtain data concerning the quality of trainee performance; b) follow-up interviews with each trainee three months subsequent to completion of training to ascertain their satisfaction with placement and supervision in their work situations; c) trainee reports concerning aspects of the training program most and least helpful in job performance; d) evaluation of foregoing data by representatives of the Office of Education, members of the therapeutic recreation profession, the vocational education profession, faculties of community colleges, and a research consultant.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - Off. Ed.

3.0062, ENHANCEMENT OF RECREATION SERVICE TO DISABLED CHILDREN

D.L. BERRYMAN, New York University, School of Education, *New York, New York* 10003

Reliable information on the quality of recreation service to disabled children is seriously limited. The proposed project is designed to provide an estimate of the quality of existing recreation services and evaluate the following: (a) procedures necessary to provide optimum service; (b) problems preventing or impeding the initiation of service; (c) factors affecting improvement and expansion of service.

A reliable stratified sample of recreation resources for disabled children in the United States is now available as a result of a quantative study (CB R-196) conducted by Comeback, Inc. with partial support of the Children's Bureau, Department of Health, Education and Welfare. These data permitted the selection of an appropriate sub sample for this project in nine Standard and one Consolidated Metropolitan Statistical Area.

Utilizing standards for recreation service and interview guides developed during the first year of the project, on-site observations and in-depth interviews will be done to evaluate the nature, quality and scope of existing services. Based on data collected, a series of manuals will be prepared and reviewed by selected personnel. The manuals will provide guidelines for initiating, administering, and improving recreation services to children who are disabled.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - P.H.S.

3.0063, FOR SUMMER PARK PROGRAM FOR HARLEM RESIDENTS

UNKNOWN, Park Association of N.Y.C., *New York, New York*

No summary has been provided to the Science Information Exchange.

SUPPORTED BY Rockefeller Brothers Fund

3.0064, AN INVESTIGATION OF LEISURE - LEISURE DIMENSIONS & LEISURE TYPES

J. NEULINGER, City University of New York, Graduate School, *New York - City College, New York* 10031

Eight areas of leisure research are planned: the conceptualization of leisure, the development of leisure questionnaires, the determination of prevailing leisure attitudes, co-variates of leisure attitudes, the development of leisure attitudes, experimental leisure research, leisure as a social problem, and the promotion of leisure.

Present work is concentrated in areas one and two. Five major dimensions of leisure attitudes have been identified through a factor analysis of an extensive questionnaire dealing with issues ranging through the entire leisure domain. In addition, an attempt is made to characterize people through an identification of behavior patterns (i.e., leisure types), emphasizing ipsative procedures to get at intra- personal dynamic aspects of leisure attitudes.

The relationship of birth-order to leisure and work attitudes is also being investigated.

Leisure is viewed in two ways: one, as a situational variable, i.e., a potential satisfier of personal needs; two, as an experimental variable, i.e., as a resultant process of the person-environment interaction.

This project started in February 1968; the first phase was finished in September, 1968; research is presently going on without a definite completion date, and without financial support.

SUPPORTED BY Russell Sage Foundation - New York, N.Y

3.0065, A STUDY OF VISITOR USE SATISFACTIONS

G.A. PETERSEN, U.S. Dept. of Interior, National Park Service, *Patchogue, New York* 11772

The purpose of this study is to investigate the use preferences and determine the level of satisfaction of visitors to a National Seashore. The visitors satisfaction with existing recreation development and programs at the Fire Island National Seashore would be measured and data would be obtained on the use preferences of the Seashore visitor. A further objective of the study is to obtain socio-economic data on the urban dwelling National Park Service visitor at Fire Island. Questionnaires will be distributed to visitors at the Seashore for their completion and return. The study will serve as a test of a basic survey format for possible use elsewhere in the National Park Service for the purpose of obtaining similar visitor use information at other areas. The study is to be conducted under approval number 42-S69003 Bureau of the Budget.

SUPPORTED BY U.S. Dept. of Interior - Natl. Park Serv.

3.0066, SKIER RECOLLECTION OF SKI AREA ADVERTISEMENTS

H.E. ECHELBERGER, State University of New York, U.S.D.A. Forest Service, *Syracuse, New York* 13210

To determine which characteristics of ski area promotion programs that are best remembered by skiers and most influential in affecting skier choice of where he will ski.

SUPPORTED BY U.S. Dept. of Agriculture

3.0067, ENVIRONMENTAL AND SOCIAL FACTORS RELATED TO WILLINGNESS TO PAY FOR A POND FISHING EXPERIENCE

J.H. ENGELKEN, State University of New York, U.S.D.A. Forest Service, *Syracuse, New York* 13210

Consumer data describing the amount fishermen are willing to pay for commercial pond fishing is needed for making better decisions concerning the operation of commercial pay-lakes. Two sets of factors will be related to fishermen's willingness-to-pay. First, socio- economic data gathered through personal interviews will be statistically related to the amount fishermen say they are willing to pay. Secondly, using fishermen registration records covering a 4-year period, willingness-to-pay for a pond fishing experience will be related to fishing success, weather conditions, travel time, and time spent fishing.

SUPPORTED BY U.S. Dept. of Agriculture

3.0068, THE EFFECT OF DIFFERENT INTERVIEW TECHNIQUES ON CAMPER REACTION TO USER-FEE QUESTIONS

G.H. MOELLER, State University of New York, U.S.D.A. Forest Service, *Syracuse, New York* 13210

To determine if there is any difference in formal-identified interview and informal-unidentified interview survey techniques in terms of camper's expressed attitudes toward the subject of public campground user-fees.

Study should provide information on the validity of currently employed survey instruments used to determine consumer willingness-to- pay for public recreation facilities. Responses to formal and informal interviews will be compared in terms of respondent answers to a series of open-ended questions about camping fees, camping experience, camping equipment, reasons for camping, and composition of camper group.

SUPPORTED BY U.S. Dept. of Agriculture

3.0069, METHODS OF MEASURING REACTIONS TO FOREST LANDSCAPE

E.L. SHAFER, State University of New York, U.S.D.A. Forest Service, *Syracuse, New York* 13210

Aesthetic qualities of forest environments influence recreation demand for different environments. Recreation planners need to know the least expensive method for measuring or evaluating the preference for different kinds of landscape. The objective, then, is to compare attitudes toward photographed forest landscape scenes with on-site attitudes toward the same scenes, also to compare attitudes toward movies of landscape corridors with on-site responses. Demantic differential techniques will be used in measuring respondents descriptive attitudes about a given landscape, whether described on the scene or through the use of photographs or movies.

SUPPORTED BY U.S. Dept. of Agriculture

3.0070, EFFECTS OF TIMBER MANAGEMENT ACTIVITIES ON ESTHETIC VALUES

E.L. SHAFER, State University of New York, U.S.D.A. Forest Service, *Syracuse, New York* 13210

To determine if various recreation publics can detect a significant esthetic difference between one-half of an Adirondack stand that was subjected to a selected cut 8 to 10 years ago and the other half that was undisturbed.

SUPPORTED BY U.S. Dept. of Agriculture

3.0071, ENVIRONMENT AND HUMAN RESPONSE

E.L. SHAFER, State University of New York, School of Forestry, *Syracuse, New York* 12224

Studies reflecting impact of urban and regional planning toward use of natural resources and pollution. Response of rural, suburban, and city population on deterioration of environment: Foul air, chlorinated water, dirty streets, deteriorated buildings and poor public services, polluted beaches and river banks, lack of natural areas and parks. Socio-economic background relevant to perception of environment and the involvement of population in pressure groups.

SUPPORTED BY U.S. Dept. of Agriculture

3.0072, OUTDOOR RECREATION CONSUMER PATTERNS THROUGHOUT A METROPOLITAN-SUBURBAN RURAL SPECTRUM

E.L. SHAFER, State University of New York, U.S.D.A. Forest Service, *Syracuse, New York* 13210

To test whether seven standard metropolitan statistical areas (SMSA's) in New York state and five resident districts within these areas differ significantly in terms of (1) resident participation rate in selected outdoor recreation activities, (2) maximum distance traveled to participate in these same activities, and (3) preference for particular outdoor recreation facilities.

SUPPORTED BY U.S. Dept. of Agriculture

3.0073, PILOT TEST OF SAMPLING PROCEDURES FOR ESTIMATING AMOUNT AND TYPE OF RECREATION USE AT VISITOR INFORMATION SERVICE CENTERS

G.A. JAMES, U.S. Dept. of Agriculture, S.E. Forest Experiment Station, *Asheville, North Carolina* 28802

The primary objective is to pilot test a sampling plan for estimating amount and type of recreation use that occurs at visitor information centers and other similar areas. A second objective is to determine, by use of questionnaire, whether a Forest Service visitor information center is attaining some of the interpretive and informational objectives for which it was established.

SUPPORTED BY U.S. Dept. of Agriculture

3.0074, RELATIONS BETWEEN BIG- AND SMALL-GAME HUNTING ACTIVITIES, AND USE OF FOREST ACCESS IN NORTH CAROLINA

G.A. JAMES, U.S. Dept. of Agriculture, S.E. Forest Experiment Station, *Asheville, North Carolina* 28802

The objectives are twofold: (1) to determine the movement and distribution of hunters in relation to forest access, and (2) to determine relations between demographic characteristics of hunters, the use of access, the nature of hunting activities, and hunting success.

SUPPORTED BY U.S. Dept. of Agriculture

3.0075, A STUDY TO DETERMINE USER REACTION OR PREFERENCE TO/FOR SEVERAL LEVELS OF CANOPY REDUCTION ON DEVELOPED RECREATION SITES

G.A. JAMES, U.S. Dept. of Agriculture, S.E. Forest Experiment Station, *Asheville, North Carolina* 28802

To determine user (camper) reaction or preference to/for several levels of canopy reduction (levels of shade) on a developed recreation site in the Southern Appalachians.

SUPPORTED BY U.S. Dept. of Agriculture

3.0076, CHARACTERISTICS OF BICYCLE USAGE AND ACCIDENTS AMONG URBAN SCHOOL CHILDREN

E.A. PASCARELLA, Univ. of North Carolina, Highway Safety Res. Center, *Chapel Hill, North Carolina* 27514

A sample of school children attending grade and junior high schools was studied for characteristics associated with bicycle usage. The sample was selected in random fashion using the home rooms in each school as the primary sampling unit. Stratification by age, sex and social class will allow evaluation by demographic variables. Sub groups will be studied on the basis of bicycle type and exposure. Exposure will be estimated through use of a cyclometer attached to the front wheel of each bicycle which contributes data to the project. Accidents will be accumulated through official and professional agencies and through direct response from the study population.

3. USER STUDIES

SUPPORTED BY No Formal Support Reported

3.0077, DEVELOPMENT OF A SYSTEM FOR DETERMINING THE CAPACITY OF WATER RESOURCES TO SUPPORT VARIOUS TYPES AND COMBINATIONS OF RECREATION USE

G.A. HAMMON, Univ. of North Carolina, School of Forestry, *Raleigh - N.C. State Univ.*, *North Carolina* 27607

Scope of the original proposal has been modified to concentrate on the manifestation of capacity as evidenced by visitor satisfaction and behavioral patterns under different degrees of use intensity. Results will be interpreted to suggest the consequences of administration alternatives as they may affect the capacity/intensity relationship.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

3.0078, A STUDY OF HUNTING METHODS, BEHAVIOR, AND ATTITUDES OF GOOSE HUNTERS IN THE DAKOTAS

G.A. SHERWOOD, U.S. Dept. of Interior, Bur. of Sport Fish. & Wildlife, *Jamestown*, *North Dakota*

Objectives: 1. to evaluate hunting methods, performance, capabilities and attitudes of goose hunters in the Dakotas. 2. To analyze the effect of flyway-wide and local area goose hunting regulations on the kill of geese and on the attitudes and performance of goose hunters.

Procedures: 1. Randomly selected hunters will be interviewed concerning their personal hunting history, attitudes regarding hunting regulations and goose identification abilities. Slides of the common species of geese and 'mistake' species will be shown with a desk-top projector for an identification test. 2. Spy-blind observations, photography, hunter contacts and bag checks will be employed to determine hunter compliance, capability and performance. Tape recorders and other specialized audio-visual equipment will be used to determine altitudes geese are shot at, number of shots fired, and crippling and kill rates of geese relative to these factors. Similar records will be kept on 'mistake' species.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0079, FISHERIES INVESTIGATIONS OF GREENLEAF AND SPORTSMAN LAKES

J. EDGINGTON, State Dept. of Wildlife Cons., *Oklahoma City*, *Oklahoma* 73105

Objective A: To measure the combined effects of (1) drawdown, (2) fish removal, (3) vegetation cover, (4) introduction of catchable channel catfish on fish populations and fishing success in a 920 acre warm water reservoir.

Procedure: Measure fisherman catch of all fish and determine the return of catchable channel catfish stocked after drawdown.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0080, SOCIO-CULTURAL IMPACTS OF WATER RESOURCE DEVELOPMENT IN THE SANTIAM

T.C. HOGG, Oregon State University, Graduate School, *Corvallis*, *Oregon* 97331

This project is to examine the effects of Santiam water resource development projects on social organizational (behavioral) and cultural (attitudinal) patterns of Santiam inhabitants. It is to focus on such effects just following the construction phase of the Foster and Green Peter Reservoirs and to test a socio-cultural model of a water resource development project in its institutional phase.

The research will make use of written documents and interview data to ascertain the social and attitudinal characteristics of the people of the Santiam as they relate to the dams. Checks on interview data are to be obtained through the use of a participant observation technique in special community settings.

Comparisons are to be made with on-going and proposed projects in the Western Region. These will include aspects related to the project's developmental cycle, i.e., planning, construction, institutionalization, and evaluation, and those of public recreation and education, political restructuring and economic reorientation, and social and attitudinal adjustments. Interim reports are available.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

3.0081, SOCIO-CULTURAL SYSTEMS IN WILLAMETTE WATER RESOURCE DEVELOPMENT

T.C. HOGG, Oregon State University, School of Humanities, *Corvallis*, *Oregon* 97331

Research is to examine the context of planning and development systems in the Willamette River Basin of Western Oregon.

Project objectives are to (1) further develop and test an existing socio-cultural model for explaining the socio-cultural impacts of water resource development, focusing on the techniques for measurement of key variables on a subregional level, (2) collect and analyze data on the socio-cultural system for water resource development in the Willamette Basin, and (3) establish a communicative format for research knowledge to populations of practitioners.

Research plans encompass (1) a description of the socio-cultural system for water resource development in the Willamette Basin and (2) the applications seminar. Research is to involve observations and questionnaires as well as literature reviews as data gathering techniques. It will make inquiry into system patterns, territoriality, alternatives, complementarity, and personality factors as special features. The seminar will be conducted in six sessions during the Winter months of 1971. It will cover the nature and scope of anthropological research in water resources development, a depth study of the concepts using data from the Willamette Basin, and a review and discussion of other projects.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

3.0082, A FAMILY APPROACH TO TREATMENT OF DISADVANTAGED YOUTH

H. BUSSE, Youth Adventures Incorporated, *Portland*, *Oregon* 97202

Youth Adventures is an autonomous nonprofit organization incorporated to establish and maintain programs and facilities to combat juvenile delinquency in Oregon. Its Residential Care Center provides a group living situation within a therapeutic family structure for emotionally disturbed and delinquent boys 14 to 18 years of age who have been remanded to the organization by county courts in Oregon. Primary emphasis is on developing healthy and meaningful relationships between staff and referred youngsters. An attempt is made to establish a sense of unity within the complex. Attitude reconstruction and change of the youth's poor self concepts are principal goals.

Psychodrama is used to train volunteer counselors in a short time period. It has been found to be an effective means of relaying information, modifying attitudes, and creating self-awareness.

Youth Adventures has provided camping experiences for institutionalized male and female adjudicated delinquents from the two state training schools in Oregon since 1962. Teenagers from an institution for dependent and delinquent youth are also included. More than 4000 delinquents have been given expense-paid week-long camping experiences through this project.

SUPPORTED BY Youth Adventures Incorporated

3.0083, ENVIRONMENTAL QUALITY PERCEPTION OF WATER-BASED RECREATION AREAS

H.B. GAMBLE, Penn. State University, Inst. For Res. on Land & Water, *University Park*, *Pennsylvania* 16802

In the field of resource management little effort has been directed towards ascertaining the environmental quality standards the public views as desirable for various uses of our land and water resources.

A scientific approach for evaluating environmental quality is needed. The development of objective criteria can aid in establishing priorities for a more efficient and effective allocation of resources to improve environmental conditions. Without a rationale for developing and managing outdoor recreation facilities based on recreational users' quality perceptions, the resource manager may impose his personal quality standards upon a public that may view quality quite differently. Because of the extent to which water-based recreation is used by outdoor recreationists and the environmental quality considerations inherent therein, this aspect and use of resources will provide the focal point for this study.

The primary purpose of this study is to explore those perceptions relating to environmental quality of water-based public outdoor recreational areas as held by resource managers and administrators and also held by society in general. A corollary objective will be to ascertain if differences exist in the environmental quality perceptions and values for water-oriented outdoor recreational areas and if these difference can be correlated with certain socioeconomic characteristics.

SUPPORTED BY U.S. Dept. of Interior - O. Wtr. Res. Rch.

3.0084, SAFETY ENGINEERING STUDY OF SKIN AND SCUBA DIVING

H.V. SCHENCK, Univ. of Rhode Island, School of Engineering, *Kingston, Rhode Island* 02881

The major aim of this research is to make a comprehensive study of the safety problems of skin and scuba diving equipment and methods from an engineering standpoint. Studies of amateur diving gear will be undertaken using both experimental and analytical approaches, with experiments occurring in the lab, indoor pool, and the open ocean. Typical considerations will include: CO2 accumulation in commercial snorkels and masks, breathing resistance in all types of devices, studies of water filling and voiding of equipment, particularly that used by children, improvements of the scuba 'package' as regards its safety in surf, violent water entries, unconscious diver-user, air depletion far from safety, and so on.

Mr. McAniff will conduct interviews with New England divers, water safety officials, life guards and others to attempt to pinpoint the trouble sources in skindiving and scuba accidents. As part of this study, we will attempt to design a scuba system suitable for use by beach guards in rough water search and rescue missions, as well as to study the beach-guard-swimmer situation using techniques of operations research in an effort to improve the safety of recreational beaches.

We suggest the research can lead to: (a) Testing methods for sport diving gear, (b) Ratings of sport-diving gear now available (c) Basic physiological parameters (pressure drop, CO2 accumulation) for use by doctors studying the effects of skindiving sports on children, the aged, and the handicapped (d) Essential design data for engineers.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - P.H.S.

3.0085, CHANGING CONSUMPTION PATTERNS OF THE AGED, 1950-1960

S. GOLDSTEIN, Brown University, Graduate School, *Providence, Rhode Island* 02912

The research is designed to insure completion of the analysis, on a comparative basis, of the income, expenditures, and savings data from the Bureau of Labor Statistics Survey of Consumer Expenditures, 1950, and Survey of Consumer Expenditures, 1960-61. The overall purpose is to: (1) identify the consumer behavior of the aged in 1960-61 and to compare these patterns with those of younger segments of the population; (2) ascertain the charges in the patterns of income, expenditures, and savings of the aged between 1950 and 1960; and (3) explore means for comparing the behavior of the aged in 1960 with the same cohorts of units ten years earlier in order to identify the patterns of change which take place among given cohorts as they proceed from one stage of the life cycle to another. In all these analyses, special attention will be given to the implications which the housing, medical care, recreation, and other categories of goods and social and psychological adjustment of the aged.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - P.H.S.

3.0086, INFLUENCE ZONES OF THE INSTITUTIONS CONNECTED WITH THE LEISURE ACTIVITIES OF YOUNG PEOPLE

G. BACKMAN, Natl. Swedish Inst. Bldg. Res., *Stockholm, Sweden*

Object: To discover and analyse those factors of physical and psychological environment which affect the visit-frequency of young people to the leisure-activities institutions. Also to suggest alternatives to present locations and capacities of such institutions in Orebro.

Work planned: Making of the questionnaire.

Survey with help of the questionnaire as well as observation studies.

SUPPORTED BY Swedish Government

3.0087, INFLUENCE ZONES OF THE INSTITUTIONS CONNECTED WITH THE LEISURE-ACTIVITIES OF YOUNG PEOPLE

O.L. HAGBERG, Natl. Swedish Inst. Bldg. Res., *Stockholm, Sweden*

Object: To analyse how the influence zones of different institutions dealing with leisure-activities are affected by the particular character of the activity.

Work completed: Survey of relevant literature.

Interview qustionnaires completed by 3000 younger people.

SUPPORTED BY Swedish Government

3.0088, PATTERNS OF VACATION TRAVELING, SWEDEN

B. JANSSON, Kungliga Universitetet I Umea, *Umea, Sweden*

Problem: To investigate patterns of travel during summer vacations with an attempt to isolate factors determining the patterns.

Method: As the nature of the problem is one of interaction and interdependence, the analysis will be based upon the concepts of interaction. Data are being collected through interviews and from statistical material from tourist centers.

Document provided by Highway Research Information Service.

SUPPORTED BY No Formal Support Reported

3.0089, DETERMINATION OF TOURIST AND RECREATIONAL USERS OF TENNESSEE STATE PARKS

P.R. LOWRY, Memphis State University, Bureau of Bus. & Econ. Res., *Memphis, Tennessee* 38111

An investigation to determine methods of collecting data and estimating the number of out-of-state visitors to Tennessee State Parks.

SUPPORTED BY No Formal Support Reported

3.0090, URBAN FISHING PROGRAM

C.T. MENN, State Parks & Wildlife Dept., *Austin, Texas* 78701

Objective: To measure the harvest and fishing time accruing to each socio-economic group from bi-weekly plants of 30 pounds of catchable size sunfish and 75 pounds of catchable size channel catfish per surface acre in a major city located warm water impoundment.

Procedures: 1. To chemically renovate Lake Como to remove existing populations of stunted sunfish and bullhead catfish. Population make up was reported by Rick Pratt, Naturalist employed by the Fort Worth City Parks and Recreation Department. 2. The federal hatcheries at Fort Worth and Uvalde will stock 30 pounds of catchable size bluegill sunfish and 75 pounds of catchable channel catfish per surface acre in Lake Como. 3. The Fort Worth Parks and Recreation Department will provide census takers to measure harvest and fishing time, by socio-economic group in Lake Como. 4. To analyze data and prepare report.

3. USER STUDIES

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0091, RELATIVE EFFECTIVENESS AND VISITOR PREFERENCE OF THREE AUDIO-VISUAL MEDIA USED FOR INTERPRETATION OF AN HISTORIC AREA

B.D. MAHAFFEY, Texas A & M University System, Graduate School, ***College Station, Texas*** 77843

Various kinds of interpretive audio-visual media are used for historical interpretation without being field tested for user preference or effectiveness in terms of perception and retention of correct factual information. More effective interpretation is needed, locally and nationally, and additional knowledge of media effectiveness and preference could improve present techniques.

The objectives of this study: Test the relative effectiveness of leaflets, signs and message recorders used for self-guiding tours; investigate the relationship between selected socioeconomic characteristics of the users and the effectiveness of each medium tested; investigate the users' expressed preference for the three media; compare the users' expressed preference for the media with the relative effectiveness of the media.

The site of the experiment is Fort Parker State Historic Site, Texas. An experimental historic tour to be established and questionnaire to be administered to determine socioeconomic background, media preference and information retention.

SUPPORTED BY Texas A. & M. University System

3.0092, PREDICTING RECREATIONAL BOATING NEEDS IN TEXAS

C.S. VANDOREN, Texas A & M University System, School of Agriculture, *College Station, Texas* 77843

The objectives of the project are to determine trends in recreational boating throughout Texas, and to acquire a data bank on the behavior, attitudes and preferences of Texas boaters. The research methodology employs a mathematical system simulation of the inter- relationships of natural resources at destinations, transportation routes and access links, and boater population characteristics at origins. In addition synagraphic mapping techniques will be employed to visualize the system's simulation of present and future behavior patterns for this recreation activity.

SUPPORTED BY Texas A. & M. University System

3.0093, RECREATIONAL DEMANDS AND TRAVEL CHARACTERISTICS

F.D. HOBBS, Univ. of Birmingham, ***Birmingham, United Kingdom***

Surveys by home interview, of urban and rural activities, participated in by residents, and related to socio-economic characteristics were made to determine recreational demands and travel characteristics. Surveys at recreational sites were also made.

Document provided by Highway Research Information Service.

SUPPORTED BY University of Birmingham

3.0094, A COMPARATIVE ANALYSIS OF SOCIAL STRATIFICATION IN ENGLAND AND SWEDEN

R. SCASE, Univ. of Kent, ***Canterbury, United Kingdom***

Analyze and ascertain the differences and similarities in mobility patterns and life styles, two closely interrelated aspects of social stratification, in different industrial societies. Patterns of inter- generational and intra-generational mobility will be analyzed. These processes will be related to differential life styles, with particular reference to patterns of informal interaction, leisure activities, and participation in voluntary associations.

Between industrial societies, of which both England and Sweden are examples, there are no significant differences in these patterns for similar occupational groups.

Matched occupational groups in England and Sweden in urban communities of similar size and economic structure will be selected, and an interview study conducted. During the first stage, interviews will be administered to manual workers in England. This will be replicated among manual workers in an urban community in Sweden.

SUPPORTED BY Center For Environmental Studies

3.0095, AN EVALUATION OF A SELF-GUIDED VISITOR TOUR AT BEAR RIVER MIGRATORY BIRD REFUGE

S.J. KOHLER, Utah State University, State Coop. Wildlife Res. Unit, *Logan, Utah* 84321

Outdoor recreation has traditionally been part of the American way of life. With population increases and more leisure time available, it will play an increasingly more important role in our lives. The limited resources of the country will have to be utilized in an efficient and practical manner to meet the demands created by the future role of outdoor recreation.

Among the measures presently being taken by governmental agencies responsible for the management of our natural resources is the attempt to manage the resources with a 'multiple use' concept in mind. This multiple use concept is beginning to be used in the management of our National Wildlife Refuges.

In February of 1967 the Utah Cooperative Wildlife Research Unit initiated a project to study some aspects of outdoor recreation on the Bear River National Wildlife Refuge near Brigham City, Utah. Objectives are: 1. To carry out and to modify original plans of the Bear River Refuge for the setting up of a visitor tour. 2. To prepare a visitor information booklet and guide for a tour of the refuge. 3. To evaluate the quality of the self-guided tour at Bear River Refuge and its value as a form of outdoor recreation.

To date, objectives 1 and 2 have been completed. Visitor questionnaires are now being collected for the evaluations to be made under objective 3. Final analysis of these questionnaires will complete the project sometime during the 1970 fiscal year.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0096, SOCIO-ENVIRONMENTAL RELATIONSHIPS BETWEEN PINEVIEW RESERVOIR, CACHE NATIONAL FOREST AND THE RESIDENTS OF METROPOLITAN WEBER COUNTY, UTAH

J.J. LINDSAY, Utah State University, School of Agriculture, *Logan, Utah* 84321

This study explores the socioenvironmental relationships between the residents of a large metropolitan population in north central Utah and a nearby national forest recreation area. Survey research techniques were used to obtain data on urban residents socioeconomic characteristics, outdoor recreation use characteristics and their outdoor recreation needs regarding this specific resource. Recommendations are made to improve the overall quality and outdoor recreation product of the national forest recreation area under study. Interestingly different relationships between socioeconomic characteristics and outdoor recreation use were found in this city- forest study complex.

SUPPORTED BY Utah State University

3.0097, IMPACT OF THE POINT-SYSTEM ON MODIFYING WATERFOWL HUNTER BEHAVIOR AND THE MOTIVATIONS UNDERLYING THESE CHANGES

L. NELSON, Utah State University, State Coop. Wildlife Res. Unit, *Logan, Utah* 84321

Over the past several decades waterfowl populations in North America have markedly declined. To curb this decline many waterfowl management practices have been implemented. These practices have helped, but to be most effective an era of species management must be entered.

Todays new management practices are aimed at efficiently utilizing waterfowl by eliminating waste and preventing under or over-harvest of waterfowl. Such practices require management on the species level. A method of species management is the 'point system' of harvest. Under the point system duck species of greater or lesser abundance in an area are assigned lesser or greater point values, respectively. Hunter bag limits are set at a given number of total points. Thus, a hunter may, for example, shoot two scarce ducks of high point value or five abundant ducks at lower point values to fill his bag point limit.

The Utah Cooperative Wildlife Research Unit has initiated a study to determine the effectiveness of the point system. The primary objectives of the study are to determine the effects of the point system on: 1. The educational status of the hunter. 2. The motivations separating selective and non-selective hunters. 3. Changes in hunter participation, harvest, and esthetics. 4. Attitudes and knowledge toward the system. 5. Actual and projected game law violations.

Study methods will involve primarily the collection of data through questionnaires and personal interviews at the Monte Vista Wildlife Refuge in Colorado.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0098, ATTITUDES OF RESIDENTS OF URBAN WEBER COUNTY TOWARDS FEES CHARGED FOR THE USE OF FEDERAL OUTDOOR RECREATION FACILITIES

L. SKABELUND, Utah State University, Graduate School, *Logan, Utah* 84321

Attitudes of urbanites towards federal outdoor recreation fees are important in relation to the success of such a fee system. The objectives of the study are: (1) To determine demographic characteristics of respondents in relation to attitudes towards fees. (2) To determine popularity of various considerations in setting fee rates. (3) Determine some favored methods of fee payments. (4) Determine if people are opposed to the policy of not using fee money for maintenance of outdoor recreation areas.

Attitudes of urban residents of urban Weber County, Utah towards fees charged for the use of federal outdoor recreation facilities will be studied. Persons fifteen years of age and older are potential respondents. Interviews will be made at the residence of the respondent. Six hundred interviews will be made on a random basis and treated statistically to test for association between attitudes and the demographic characteristics of the respondent. Percent tabulations will be made to meet the latter objectives.

SUPPORTED BY Utah State University

3.0099, ECONOMIC ANALYSIS OF ENVIRONMENTAL QUALITY EFFECTS ASSOCIATED WITH SEASONAL HOMES

M.I. BEVINS, Univ. of Vermont, Agricultural Experiment Sta., *Burlington, Vermont* 05401

Determine the environmental situations (positive and negative) associated with seasonal homes and analyze the attitudes, interests, and goals of people for a quality seasonal home environment.

Evaluate the social and private costs and benefits of identified environmental situations at both the regional and national level.

Assess current and alternative institutional arrangements intended to correct inefficiencies and inequities in resource use in seasonal home communities.

SUPPORTED BY U.S. Dept. of Agriculture

3.0100, THE PREVENTION OF SKI ACCIDENTS

J.O. OUTWATER, Univ. of Vermont, School of Technology, *Burlington, Vermont* 05401

The most important category of ski accidents includes those that result in a torsional fracture of the tibia. Previous work at the University of Vermont has shown that such accidents can be prevented by suitable calibration but that testing of presently available equipment shows that much of it is so poorly designed and manufactured that it, in fact, contributes seriously to accidents.

The program of investigation will result in firm research-based recommendations to skiers, ski equipment designers, area operators and physicians in regard to the correct design of release equipment, boot design and ski design.

SUPPORTED BY U.S. Dept. of Hlth. Ed. & Wel. - P.H.S.

3.0101, ATTITUDES, OPINIONS AND GOALS CONCERNING REGIONAL RESOURCE PLANNING AND DEVELOPMENT

E.H. TOMPKINS, Univ. of Vermont, Agricultural Experiment Sta., *Burlington, Vermont* 05401 (VT00162)

OBJECTIVE: Determine attitudes of Vermont residents toward alternative goals of regional resource planning and development. Assist local and regional planning and development groups to conduct surveys of attitudes concerning alternative goals in their community or area. Determine goals or policy objectives of state and federal resource development agencies.

APPROACH: Surveys will be conducted in cooperation with regional and local groups which have been formed for the purpose of economic or resource planning and development. A core of questions will be used with additional questions at the option of the group concerned. Local assistance will be utilized as much as possible in conducting the survey. Two methods will be utilized. These will consist of mail surveys, and surveys administered to individuals attending group meetings. Information will be punched on cards for machine tabulation. Data from the surveys will be analyzed by the project leader. A report will be published for each survey conducted.

PROGRESS: Two additional attitude surveys have been completed in Chittenden and Grand Isle Counties. Plans have been made for a survey in Bennington County. Partial reports have been prepared for the White River RC&D Project Area, and Chittenden, Rutland, Franklin, and Southern Windsor Counties. The results of these surveys indicate the attitudes of the area residents toward such things as land-use planning, community improvement, zoning, resource development, development of recreation facilities, industrialization, and beautification. Things needed to improve the municipalities and the region are also checked on the questionnaire used. Analysis of some of the data from these surveys indicates the following: Most Vermonters think of their county as being the most logical area for planning and development; 'Better cooperation among towns,' is felt to be the thing most needed to make these areas better places in which to live. Among 'things that have reached the danger point' in their area, 'real estate taxes' was checked most frequently. 'Control stream pollution' was most frequently checked as the item that should receive prompt attention. 'Bring in new industries,' ranked second. These findings are being used by state government officials, regional and local planning and development groups, Extension workers, and community improvement organizations.

SUPPORTED BY U.S. Dept. of Agriculture

3.0102, A SOCIOLOGICAL CRITERION FOR PUBLIC RESOURCE ALLOCATION

J.C. HENDEE, U.S. Dept. of Agriculture, Pac. Nw. For. & Rg. Expt. Sta., *Seattle, Washington*

To develop a sociological criterion for public resource allocation based on satisfaction of underlying personal motives. To test the criterion with data from recreation visitors to National Parks and Forests.

SUPPORTED BY U.S. Dept. of Agriculture

3.0103, OUTDOOR RECREATIONISTS MEMBERSHIP IN CONSERVATION GROUPS AND OUTDOOR CLUBS IN THE PACIFIC NORTHWEST

J.C. HENDEE, U.S. Dept. of Agriculture, Pac. Nw. For. & Rg. Expt. Sta., *Seattle, Washington*

To identify the proportion of different types of recreationists who belong to conservation groups or outdoor clubs in the Pacific Northwest and to compare them with recreationists in general and the population at large.

SUPPORTED BY U.S. Dept. of Agriculture

3.0104, USE AND CONSTRUCTION OF QUESTIONNAIRES FOR RECREATION RESEARCH

J.C. HENDEE, U.S. Dept. of Agriculture, Pac. Nw. For. & Rg. Expt. Sta., *Seattle, Washington*

1. To review and annotate all studies and pertinent literature on the use of mailed questionnaires for reference by recreation researchers. 2. To prepare guidelines to assist recreation researchers and managers wishing to use the questionnaire method to collect information from users.

SUPPORTED BY U.S. Dept. of Agriculture

3.0105, WILDERNESS RECREATION INTERPRETATION

J.C. HENDEE, U.S. Dept. of Agriculture, Pac. Nw. For. & Rg. Expt. Sta., *Seattle, Washington*

To develop an interpretive booklet for the Glacier Peak Wilderness that will serve as a management tool to help raise the quality of available wilderness experience, disperse use to little used portions of the wilderness and communicate proper wilderness behavior to others.

SUPPORTED BY U.S. Dept. of Agriculture

3.0106, THE EUGENE LADIES OUTDOOR RECREATION EDUCATION PROGRAM AND ATTITUDE CHANGE

J.C. HENDEE, U.S. Dept. of Agriculture, Pac. Nw. For. & Rg. Expt. Sta., *Seattle, Washington*

To determine the direction and extent of change in attitude toward the natural environment as a result of participation in a ladies outdoor recreation program.

SUPPORTED BY U.S. Dept. of Agriculture

3.0107, ORGANIZATIONAL INVOLVEMENT OF CONSERVATION GROUP MEMBERS

J.C. HENDEE, U.S. Dept. of Agriculture, Pac. Nw. For. & Rg. Expt. Sta., *Seattle, Washington*

To explore the following aspects of conservation group and outdoor club members: 1. Multiple membership in different conservation organizations. 2. Membership by conservation group members in other unrelated organizations. 3. Relationships between membership in conservation organizations and participation in outdoor recreation. 4. Levels of participation in internal and external operations by members of different types of conservation groups and outdoor clubs.

SUPPORTED BY U.S. Dept. of Agriculture

3.0108, DEPRECIATIVE RECREATION BEHAVIOR--ITS INCIDENCE AND CONTROL

J.C. HENDEE, U.S. Dept. of Agriculture, Pac. Nw. For. & Rg. Expt. Sta., *Seattle, Washington*

To describe and interpret those recreation behaviors which are inappropriate or depreciative in their effects on recreation environment as perceived by recreation users and managers. To design a system of observation techniques to monitor such behavior for experimental study and to identify and test for the feasibility and effectiveness of some potential management techniques to control such behavior.

SUPPORTED BY U.S. Dept. of Agriculture

3.0109, HUMAN BEHAVIOR ASPECTS OF WILDLIFE MANAGEMENT

J.C. HENDEE, U.S. Dept. of Agriculture, Pac. Nw. For. & Rg. Expt. Sta., *Seattle, Washington*

To identify, summarize and evaluate literature on human behavioral aspects of wildlife management. To develop a problem analysis suggesting needed research and appropriate priorities.

SUPPORTED BY U.S. Dept. of Agriculture

3.0110, THE EXPERIMENTAL CONTROL OF LITTERING

R.N. CLARK, Univ. of Washington, U.S.D.A. Pac. N.W. For. Sta., *Seattle, Washington* 98105

To develop a reinforcement system for the experimental control of littering. Pertinent questions are, Under what conditions can littering behavior in a controlled environment be changed? what types of reinforcers are required to induce other appropriate behavior to combat littering? will reinforcement changing the behavior of children be sufficient to combat littering behavior in adults? to what extent can litter-combating experimental procedures be adopted to other conditions, e.g., natural environment areas, etc.? to what extent will reinforcing anti-litter behavior carry over to unreinforced conditions?

SUPPORTED BY U.S. Dept. of Agriculture

3.0111, MANAGERS AND USERS PERCEPTION OF UNDESIRABLE CAMPGROUND BEHAVIOR

R.N. CLARK, Univ. of Washington, U.S.D.A. Pac. N.W. For. Sta., *Seattle, Washington* 98105

To determine the extent to which campground managers correctly perceive the attitudes of campers toward inappropriate behavior by other recreationists. Primary interest will focus on the definition, by managers versus campers, of inappropriate (depreciative) behaviors, who is thought to be responsible, and the controls which are thought to be effective and acceptable.

SUPPORTED BY U.S. Dept. of Agriculture

3.0112, WILDLAND RECREATION USE AND SOCIAL INTERACTION

J.C. HENDEE, Univ. of Washington, U.S.D.A. Pac. N.W. For. Sta., *Seattle, Washington* 98105 (PNW1901)

OBJECTIVE: Characterize outdoor recreation users and use; to better understand recreation visitor motivations, perception, needs, and trends.

APPROACH: This research work unit is devoted to 'people' studies. Recreation user populations, their backgrounds, recreational choices, attitudes, activities, and interests will be defined and sampling methods developed. Forest recreation visitors--from back country hikers to those who merely drive forest highways--will be studied and characterized. Emphasis will be upon finding ways to alleviate conflicts between recreation uses, between recreation and other forest uses, and to lessen depreciative human behavior.

PROGRESS: Wilderness recreation is culturally selective. Participants are typically highly educated and took first trip before age of 15. Benefits may be primarily social as most trips are by families or small groups of close friends. Less than 30 percent belong to conservation groups or clubs, but the 400 members encountered represented 218 different organizations. Future wilderness visits may exceed classified wilderness carrying capacity yet man users prefer facilities and development essentially prohibited by the Wilderness Act. This suggests the need for semi-wilderness to relieve pressure on classified wilderness and facilitate its protection. Vandalism, littering, rule violations and nuisance behavior in public campgrounds depreciate the environment and recreation experiences. Preliminary study of such behavior revealed more undesirable activity than anticipated and all users, not just teen-agers are responsible. Study of conditions associated with high levels of depreciative behavior and feasible means of control will continue. Proposed simple method for classifying and evaluating roadside scenery will facilitate utilization of scenic opportunities by resource managers and planners.

SUPPORTED BY U.S. Dept. of Agriculture

3.0113, PUBLIC HUNTING AND/OR FISHING AREA USE SURVEY

J.E. RIFFE, State Div. of Wildlife Resour., *Charleston, West Virginia* 25305

To obtain estimates of recreational uses, game kills, fish catches, and hunting and fishing success rates on Public Hunting and/or Fishing areas in West Virginia a survey using personal interviews was designed for nine (9) State-owned areas. A questionnaire form was designed and interviews were conducted on a sampling by proportion scheme. The data was keypunched and tabulations and analyses done by special computer programs.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0114, CONSUMER ANALYSIS FOR SPECIFIC FOREST-ORIENTED RECREATIONAL ACTIVITIES

K.D. MCINTOSH, West Va. University, Agricultural Experiment Sta., *Morgantown, West Virginia* 26506 (WVA00188)

OBJECTIVE: Identify and analyze those social, psychological and economic variables which motivate consumers to participate in outdoor recreational activities. Ascertain and evaluate consumer satisfaction with locational and environmental factors as they relate to consumption patterns. Identify and analyze the reactions of participants to rules and regulations, physical facilities, social activities and off-site accessory attractants. Identify and analyze the expenditures incurred by those who actively participate in outdoor recreational activities.

APPROACH: A random sample of hunting and fishing license holders will be drawn and by use of personal interviews or mail questionnaires, or both, information will be generated to be used in the analysis. Multiple correlation analysis will be used based upon such variables as income, age, education, experience, residency, sex, rural background, and leisure time and the frequency of hunting and fishing. The attitude of hunters and fishermen with regard to hunting and fishing facilities, rules and regulations, attitudes toward landowners and their willingness to pay for the privilege of hunting and fishing on privately-owned lands will be investigated.

PROGRESS: Data obtained from a random sample of hunters and fishermen have been edited, coded and punched on IBM cards. Computer programs were written and printouts obtained for participation rates, places hunted and fished, success rates, distances traveled, access problems and other socio-economic characteristics of hunters and fishermen. This information is now being reduced to graphs, figures, tables and charts for use in a Northeast regional publication.

SUPPORTED BY U.S. Dept. of Agriculture

3.0115, ACTIVITIES AND ATTITUDES OF WISCONSIN HUNTERS

G.L. BULTENA, State Dept. of Nat. Resources, *Madison, Wisconsin* 53701

Determine the attitudes of waterfowl hunters toward various waterfowl management proposals.

SUPPORTED BY U.S. Dept. of Interior - Bu. Sport Fish.

3.0116, AN INVESTIGATION OF THE DETERMINANTS OF & DETERRENTS TO PARTICIPATION IN OUTDOOR RECREATION

E. DAVID, Univ. of Wisconsin, School of Agriculture, *Madison, Wisconsin*

An investigation of the determinants of and deterrents to participation in outdoor recreation. A cross section of adults in the state of Wisconsin were interviewed about their participation in swimming, fishing, boating, canoeing, camping, hunting, picnicking, pleasure driving, winter sports and walking for pleasure. Regression analysis was performed relating participation in each sport to socio- economic characteristics. These characteristics were identical in all the analyses enabling the researcher to trace the influence of one, for example income, through the range of outdoor recreation activities. The results of the study are available in preliminary form.

SUPPORTED BY University of Wisconsin

3.0117, INVESTIGATION OF EFFECT OF PERCEIVED WATER POLLUTION ON PARTICIPATION IN THREE OUTDOOR REC. ACTIVITIES - FISHING, BOATING & SWIMMING

E. DAVID, Univ. of Wisconsin, School of Agriculture, *Madison, Wisconsin*

An investigation of the effect of perceived water pollution on participation in three outdoor recreation activities: fishing, boating, and swimming. The intent is to put perceived pollution into context among other deterrents to participation such as distance, family composition, family income, etc. A sample of adults in Wisconsin has been interviewed in a household study.

SUPPORTED BY University of Wisconsin

3.0118, ATTITUDES TOWARD WILDERNESS - SOCIOLOGICAL PERSPECTIVE

T.A. HEBERLEIN, Univ. of Wisconsin, Graduate School, *Madison, Wisconsin*

The object of this research is to develop a comprehensive set of measures of attitudes toward wilderness. Attitudes are seen as being composed of three components (1) cognitions or beliefs about the object, (2) affect or the degree of liking or disliking, and (3) a behavioral disposition. Development of such an instrument would allow examination of such basic sociology questions as (1) the nature of attitudes, (2) the dynamics of attitude change, (3) the relationships between attitudes and behavior, (4) the relationships between attitudes and group process, and such policy issues as (1) the assessment of attitudinal means of social control of wilderness users as an alternative management choice, (2) distinctions among types of users and (3) assessment of the attitudinal effect of both policy changes and education programs.

Items to measure the major sets of beliefs regarding wilderness will be constructed from use of depth interviews, content analysis, and expert judgment. Affect will be assess via semantic differential ratings of concepts generic, or closely related to the meaning of wilderness. These preliminary instruments will be administered to general samples (rather than limited to wilderness users). Standard item analytic techniques will be applied to the belief items, and the matrix of item intercorrelation will be factor analyzed. Factor scores from the emergent clusters will be related to affect measures. Several replications on separate samples are proposed, and such basic validity checks will be examined. These measured will then be made available for general use.

SUPPORTED BY University of Wisconsin

3.0119, THE EFFECT OF MORAL NORMS AND SANCTIONS ON LITTERING BEHAVIOR

T.A. HEBERLEIN, Univ. of Wisconsin, School of Social Science, *Madison, Wisconsin* 53706

The proposed research considers two questions of social control: the effect of attitudes and moral norms on behavior, and the effect of sanctions on behavior when the enforcement of the sanctions is low. Failure in the activation of moral norms at the time of decision-making is considered as an explanation for the occurrence of littering behavior in spite of adherence to a moral norm defining it as wrong. An empirical test of this explanation is proposed where people are placed in a High Litter Potential situation and a sample of litterers and non- litterers and a control group is interviewed immediately after the transgression and then mailed a longer questionnaire at a later date. The second question concerning the relationship of sanctions to behavior when the sanctions have various probabilities of enforcement is also subjected to empirical tests. One study will examine the relationship between threatened legal sanctions and the actual amount of litter as reported in the Keep America Beautiful study, controlling for traffic density and the frequency of warning signs. The cognitive dissonance explanation of the relationship between internalization and punishment levels will be examined in a field experiment with littering as the dependent variable.

SUPPORTED BY National Academy of Sciences - Washington

3.0120, DEMOGRAPHIC CORRELATES OF HUNTING PARTICIPATION & SELECTED ATTITUDINAL CHARACTERISTICS OF HUNTERS WITH EMPHASIS ON WATERFOWL HUNTERS

L.L. KLESSIG, Univ. of Wisconsin, Graduate School, *Madison, Wisconsin*

Objectives: 1. to compare nonhunters, former hunters, and present hunters on several demographic variables. 2. to ascertain the motives underlying hunting participation and the attitudes of hunters toward salient issues. 3. to obtain information on the activities of hunters. 4. to obtain information on the attitudes of waterfowl hunters toward issues related to species management.

Procedures: 1. Interview survey of a random stratified sample of Wisconsin adults. 2. Mail questionnaire survey of a random sample of purchasers of resident hunting licenses.

SUPPORTED BY U.S. National Science Foundation

3.0121, THE DUCK HUNTER AND SPECIES MANAGEMENT

L.L. KLESSIG, Univ. of Wisconsin, School of Natural Resources, *Madison, Wisconsin* 53706

Objectives: 1. Ascertain the attitudes of waterfowl hunters toward various species management proposals. 2. Obtain information on the willingness of waterfowl hunters to undergo training to improve their ability to identify ducks.

Procedures: 1. Mail questionnaire survey of a random sample of purchasers of Wisconsin resident hunting licenses.

SUPPORTED BY Wisconsin State Government

3.0122, HEALTH TOURISM IN YUGOSLAVIA

A. ZOR, Urbanistic Inst. S.R. Slovenia, *Ljubljana, Yugoslavia*

Problem: Examine the concept of tourism for health, regarding its actual stage of development in Yugoslavia, as well as actual trends and tendencies connected with this concept in other parts of the world.

Document provided by Highway Research Information Service.

SUPPORTED BY No Formal Support Reported

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